

ACTION RESEARCH IN DEVELOPING KNOWLEDGE NETWORKS

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ABSTRACT

This paper describes the experiences of the Eastern Head Injury Study in creating a strategic regional head injury service framework using a collaborative action research methodology.

The types of data, information and knowledge required to develop and support such a framework for both development and successful implementation are identified. This includes the identification of existing knowledge/information systems, variability and gaps in these and how the systems fit together, by a number of evidence-gathering and knowledge-sharing methods.

The discussion debates the value of the action research approach and what principles are necessary in developing and maintaining knowledge networks.

The project demonstrates that an understanding of the social learning cycle can help in understanding how the pieces fit together, and how the information systems need to be in place to provide the information (or data or knowledge) in the appropriate format, to make the learning possible.

KEYWORDS

ACTION RESEARCH HEAD INJURY KNOWLEDGE NETWORKS SERVICE PLANNING

1. INTRODUCTION

The Eastern Head Injury Group (EHIG) in the UK has created a strategic framework for regional head injury service provision and focuses on both development and effective implementation. This has required identification of the multiple and complex intra and intra-organisational information and knowledge systems in order to develop cross-sectoral strategies to include and integrate into a comprehensive knowledge-centred regional service framework for head injury. Understanding how knowledge is built and evidence gathered, interpreted and disseminated is crucial to understanding the changes needed to create such a framework.

The development of reliable, usable and transferable information/knowledge into a system that requires the co-operation of a wide range of professionals, including healthcare providers, planners and policy-makers, is difficult to implement. In order to turn strategy into results at organisational and macro-organisational level, collaborative action research was used as the most effective methodology in identifying and overcoming barriers to change in a multidisciplinary service such as head injury. The study focused on:

- a) improving the knowledge base available to planners, managers and providers to support improvements in head injury services
- b) changing the context in which knowledge is used to further improve and transform services
- c) establishing a head injury network to bring researchers and users of knowledge together.

This paper discusses the type of data, information and knowledge required to support a regional framework for head injury service improvement, focusing on the action research approach used.

The discussion debates the value of the action research approach, and whether such principles are necessary in development and maintenance of knowledge networks.

2. BACKGROUND

Learning theorists have argued that successful adult learning is often experiential, requiring an engagement with real world problems and situation experienced by the learner.[1] Adult learning about work is often social and situated,[2] and the term 'communities of practice'[3] is used to describe the informal exchange of expertise and knowledge that occurs in such learning situations. The NHS has adopted some of the ideas about knowledge management, communities of practice in the various initiatives to improve service delivery and speed up the process of learning from best practice elsewhere, translating lessons learned in one setting to another. The Specialist Libraries in the National Library for Health are based on community of practice principles,[4] and the CHAIN project used similar principles.[5] Networks of practice usually imply a looser grouping of expertise than a community of practice, to exchange expertise rather than working together collaboratively, for a shared purpose, as might be expected in a community of practice. The NHS plan of 2000 envisaged that Collaboratives would promote the redesign of services.[6] An evaluation of these Collaboratives compared them with private sector knowledge management and concluded that knowledge transfer was not as easy as had been expected in the NHS. The most useful aspects for the Collaborative participants often featured the user involvement, and work on the patient pathway, and one of the weaknesses of the collaboratives was the emphasis on information, at the expense of knowledge, particularly the co-creation of knowledge.[7] Such problems are not new in the NHS or in the health sector in general.[8 9] There has been an emphasis on implementing evidence-based practice, but such initiatives may not take full account of the ways in which knowledge becomes more or less codified, more or less abstract, and more or less diffuse during the cycle of social learning.[10]

There are, however, examples of groups working across professional and organisational barriers in a way to support cultural change, raise clinical quality and improve patient experience and outcome.[11] The presumed benefits of clinical networks include a focus on patient-centred care, involvement of clinicians in redesign and quality improvement, encouragement of multidisciplinary team working, stimulation of innovation, and better utilisation of scarce resources. Examples of clinical networks already developed in the Eastern Region are West Anglia, Mid Anglia and Norfolk and Waveney Cancer Networks, Critical Care Networks, the Emergency Care Network and the Anglian Cardiac Network.

However, the weakness of this and other NHS initiatives for change is the lack of guidance on implementation. A report commissioned by the NHS Modernisation Agency[12] which reviewed progress of the NHS Plan halfway through its 10-year duration, concludes that "there is a need to strengthen the underpinning theoretical base of NHS improvement work" and that in general, NHS improvement activities are under conceptualised, and changes were started without due reflection. A report from the NHS Institute for Innovation and Improvement[13] states that 'the objective of transformational change is to not only influence processes, but to change mindsets, cultures, activities and organisational power bases.' Strategies for achieving change successfully often seem to maintain alignment but also, paradoxically, to pursue adaptability.

In discussing the development of the NHS, Peckham comments that the health service is decades behind service industries with regard to handling information.[14] The web of interconnected change currently taking place in the health service requires good communications within the organization: however communication both upward and downward in the NHS is imperfect, as are linkages across the service. An initiative in one location may not be

known about even by other staff in the same organisation, and is even less likely to be known about elsewhere in the country.

Action research principles vary, but most emphasise the importance of participation and reflection,[15] and change is thus agreed on the basis of evaluated evidence. Lewin developed action research through analysis of group decision making and concluded that conforming to group norms provides a key force for change.[16] Lewin's stage model of action research parallels his theories of organisational change (unfreeze/plan; move/act; refreeze/reflect). Within the health sector action research initiatives include a wide range of work often involving nurses or therapists.[17 18] Such initiatives may be localised to a department or unit, and other theoretical perspectives may be useful when considering changes across larger geographical and more decentralised structures. Given the rate of change in NHS organisational structures, more useful perspectives might be those that focus less on particular organisations but more on the process of networking and the values involved (as defined by Castells [19]). Chambers[20] identifies four core attributes of network to be diversity (and relationships, trust between diverse people), dynamism, democracy and decentralisation. Participatory action research shares some of these principles: 'a participatory, democratic process concerned with developing practical knowing.'[21] In information systems research, the concept of 'situated change' helps in understanding organisational transformation, to understand how small changes contribute to the process of incorporating new information systems into working practices.[22] Actor-network theory denies the existence of purely social or technical relations, and attempts to understand the innovation in information systems as a 'translation', examining how alliances and networks develop to support the innovation process.[23] In many ways this is similar in thinking to the Lewin force field model that examines the forces for and against change, and encourages actions that reduce the barriers to change and promote the enablers. The difference is that actor-network theory offers a research perspective that is open to the unexpected happening among the network associations. Participatory action research is a more active approach to promote change.

3. OBJECTIVES/METHODS

As a proactive response to recommendations for fundamental change in Head Injury service provision[24] a comprehensive mapping exercise was undertaken by the EHIG to see what head injury services were currently available locally and regionally, how seamlessly or otherwise that provision was linked, and to systematically assess the impact and implications of any changes. The aims were to:

1. Identify and evaluate existing formal and informal knowledge/ information systems.
2. Identify all stakeholders. Service provision to Head Injured patients is complex with multiple specialties, disciplines professions, organisations and sectors involved, as well as a diversity of disabilities in the patients. It is important to involve people from different agencies in the study, as each will bring a different perspective and knowledge.
3. Examine and understand how the systems fit together, including identifying gaps and variability in systems.

A number of information-gathering methods were used in a collaborative action research approach. These included: questionnaire surveys (3 cycles), semi-structured interviews (2 cycles) and service visits, that were both fact-finding and also assessed perceptions of the current service, audits, pilot studies, and evaluation studies. The evidence gathered in the questionnaires and interviews covered all stages of the patient care pathway and all aspects of service, including resources, management and existing information systems for each stage and for all categories of head-injured patient. Detailed data for statistics was obtained from a

number of sources including A&E registers, Ward registers, patient notes, audit reports, ICD-10 coding reports, and Hospital Episode Statistics, and included patient demographics and details of the head injury. The comprehensive mapping of current service provision included current levels of capacity, paths, patient service provision, A&E attendances, acute admissions (short and long stays), long-term care/ rehabilitation arrangements, referrals and referral destination. Both quantitative and qualitative information/evidence was obtained, since evidence for sustainable planning and transformational change is complex, heterogeneous and from multiple and disparate sources.[25] Qualitative data illuminates processes and explores diversity.

The data collection and analysis were interlinked, but it was possible to identify three cycles of action research during the project (Figure 1). One of the main roles of the researcher was to map provision, and act as the co-ordinator for the collection, analysis and reporting of information. Resulting from this comprehensive mapping[26]and description of processes, the next two phases of the project examined collaboration, to link the information and information systems, for meaningful discussions about possible improvements. At the same time there was emphasis on communication and co-ordination for knowledge sharing.

Several methods of knowledge-sharing were used to discuss issues and problems and plan for change and successful implementation, including: Multidisciplinary conferences and meetings (informal networking and formal presentation), workshops and focus/working groups (to include all stakeholders), study days, widespread dissemination (publication in wide range of journals), and a website as an information resource.[27] As a result, a set of service planning and evaluation tools were collaboratively developed for the regional Head Injury Service.

The first three phases of the study identified barriers to and drivers for effecting change and a sustainable integrated regional strategy and service framework. The final phase of the study focused on implementation, and the aims focused on translating knowledge into practice for sustainable change, as well as supporting and developing the knowledge base, so that new staff, or groups new to the project could appreciate the whole systems approach and contribute to the changes.

Implementation of changes in head injury services was based on prior experience in earlier phases of the project, as well as research evidence about the type of information format required to convince and engage other stakeholders. For example (Figure 2), active engagement with commissioners (primary care NHS trusts, strategic health authorities) required practical summaries, evaluations, evidence of cost-effectiveness. Personal contacts, and workshops were necessary. Business plans, action plans for change were based on relevant and timely data gathering for the observation ward project at two district general hospitals, and to make the case, through interpretation of the data collected, for additional consultant and nurse practitioner posts. Although information was sometimes collected for discrete project aims, the interpretation of that information provided evidence that contributed to the planning of other parts of the project. In the third phase of the project the rehabilitation service planning was based on the evidence coming from various other parts of the project.

The research and audit programme (e.g. on head injury transfers, delays to rehabilitation, CT scanning, NICE, Head Injury Standards and EHIG Rehabilitation Codes) required development of standards for the data[28], and without that creation of new knowledge in the mapping the systems for future audit and research would have been very difficult.

PHASE 2	Oct 2001	Discussion of HI co-ordination at multidisciplinary HI conference	PLAN
	Nov 2001 – Feb 2002	Initial regional survey of role by Principal Researcher	ACT
	June 2002	Discussed at multidisciplinary meeting	REFLECT
	Sept 2002	BI Co-ordinator Proposal drawn up	PLAN
PHASE 3	Jan 2003	BI liaison officer appointed at Hosp 01 Joint HI Ward round with BI Co-ord.	ACT
	June 2003	TBI Follow-up clinic w. BI Co-ordinator included	
	Oct 2003	Discussion of HI co-ordination at multidisciplinary HI conference	REFLECT
	Nov 2003	Report of HI co-ordinator role disseminated regionwide	PLAN
	Dec 2003	HI Co-ordination template developed	
PHASE 4	2004	Pilot of HI co-ordination template	ACT
	2005	Publication of findings in JRSM and website	REFLECT
		2 project lead posts created in E.Region to look at HI Co-ordination locally	PLAN
		3 new HI Co-ordinator-type posts created in E Region	ACT
		Development of inreach/outreach HI co-ordination role at Hospital 01 in partnership with Headway	
	2006/07	Wider publication in ACNR Plan for regional HI co-ordinator course in partnership with Solicitors	REFLECT PLAN

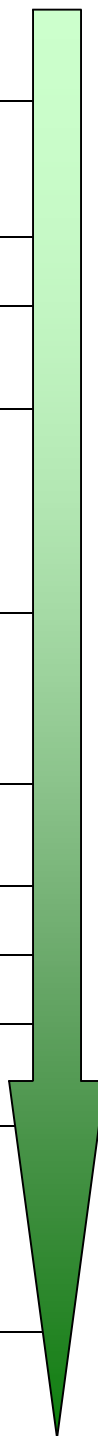


Figure 1: Chronology of examination of role of HI co-ordination showing Action Research process

Steps to promoting the uptake of research findings

- o **Define the appropriate “message”, i.e. information to be used**
- o Decide which processes need to be altered
- o Involve the key players, i.e. those who will implement change or who are in a position to influence the changes
- o Identify the barriers to change and how to overcome them
- o Decide on specific interventions to promote change, e.g. guidelines, educational programmes
- o Identify levers for change, i.e. existing mechanisms which can be used to promote change
- o Determine whether practice has changed along the desired lines – the use of clinical audit

Important characteristics of the “message”

Aspects of content

- o Validity
- o Generalisability (i.e. setting in which it is relevant)
- o Applicability (i.e. to whom it is relevant)
- o Scope
- o **Format and presentation**

Other characteristics

- o Source of the message (e.g. professional body, DOH)
- o **Channels of communication (i.e. how it is to be disseminated)**
- o **Target audience (i.e. recipients)**
- o Timing and updating

Contextual/systematic differences for researchers, clinical practitioners and administrative & legislative decision makers (adapted from Lomas)²⁴

Context/Setting	Types of evidence preferred	Communication formats used
Researchers Universities; private sector; discipline oriented; long term time frames	Original research; peer reviewed; scientific>qualitative; basic>applied research	Academic journals; academic meetings; internet
Clinical Community practice; clinical management; patient oriented; short term time frames	Practical summaries; clinical applications; patient preferences; applied>basic research	Colleagues/conferences; summaries/reviews; audit/ feedback; Professional journals
Administrative Public agencies; programme oriented; population oriented; varying time frames	Practical summaries; programme evaluations; cost effectiveness; applied>basic research	Summaries/reviews; personal contacts; conferences/meetings; internet, journals, media
Legislative Elected for a; problem oriented; responsive to crises; varying time frames	Problem summaries; policy solutions; cost effectiveness; anecdotal>scientific	Staff briefings; personal contacts; polls constituents; media

Figure 2: Issues in use of knowledge: accessibility, dissemination and uptake of research

The project required an awareness of the challenges of change (Table 1), particularly when dealing with changes imposed externally, such as the publication of the National Service Framework on Longterm Neurological Conditions. The change to the Canadian Rule for CT scanning represented a large, and possibly unwelcome change to current practice in the Region – a reactive stance towards external challenge was likely. The project response was to collect data to assess the impact of the change, in co-operation with staff at one hospital, and the adapted rule that was developed, could be viewed as a method to ‘co-create joint problem-solving.’

Workshops and meetings were frequent features of the work, and these provided opportunities not just for dissemination to clinical colleagues, but also ‘time for rethinking and replanning together.’

Table 1: Drivers of change in head injury service provision

<p><i>Professional</i> RCS and SBNS Safe Neurosurgery Reports New evidence such as CT v SXR (new technologies), follow up for MHI, NCCU care Changing work patterns/roles such as A&E and Radiology, ENP/CNPs, multidisciplinary working</p>
<p><i>National/political</i> NHS Plan, NHS Modernisation Agency, NICE, NSF on long term conditions, redesign of Emergency Services, National initiatives / targets</p>
<p><i>Outcome and quality</i> Quality of life for patients; service quality; quality of clinical care, rehabilitation</p>
<p><i>Demographic /Social factors</i> Increase in RTAs, particularly motorcycle; alcohol abuse and link with head injuries (falls, assaults); ageing population (falls, HI pts. Often young and likely to live full span). Potential continuing financial and other burden on health and other services: workforce, training and education, rehabilitation.</p>

4. FINDINGS

The findings from the first phase of the study revealed various information and communication systems used in head injury care (Figure 3). Examination of these revealed gaps, variability and the need for standardisation and clear systems. There were reservoirs of knowledge (people, groups, expertise, practices, technologies, reports, organisations) and these knowledge sources needed to be integrated, and the groups to be more interactive. The project was also coping with a wide range of types of knowledge, data, evidence, information, such as guidelines, standards, protocols, CPD/training/education, research and audit evidence, government reports and NHS initiatives, reports from professional bodies and the need for these to be implemented and evaluated.

The collaborative approach revealed the importance of understanding information-seeking behaviour and how this varies in different professional and organisational cultures, affecting interpretation and transfer of knowledge, how and for what purpose it is used, and different

Scope of knowledge

Inter -/ intra-organisational; inter-/ intra-specialty; multidisciplinary; inter-/multi professional; inter-/intra- sectorial

Multidimensional information / knowledge flows. Formal/ informal; Written / unwritten; structured

Stakeholders	
Organisations	Acute hospitals, Regional Neurosurgical Units, Rehabilitation organisations, NHS/Department of Health
Specialties	A&E, Neurosurgery, Rehabilitation, General Surgery/Orthopaedic Surgery, Trauma, Radiology, ITU, Medicine for the Elderly, Paediatrics, Public Health Medicine, Neurology, Neuropsychology
Professions	Doctors, (incl. GPs), surgeons, nurses, therapists, managers
Sectors	Voluntary/Charitable, Social Services, Legal, Education, Mental Health, Private Providers, NHS/Department of Health/Government
Geographical	3 Strategic Health Authorities, 6 counties, 42 Primary Care NHS Trusts Local – regional – national, NHS, Department of Health
Stages and skill mix	Academic, research, front-line providers/clinicians, management, commissioners, ‘experts’, Planners / Providers / Patients and carers
Systems	
Learning	Training, education, Continuing medical education, new research evidence, national/NHS
Communication	Admission, referral/transfer, discharge, repatriation. Social networks, conferences, meetings, focus groups
Pt carepathways	Admission, referral/transfer, discharge, repatriation, rehabilitation
Types of info/knowl/data	
	Data; evidence; patient information; demographic; expertise; experience; anecdotal Protocols; clinical guidelines, recommendations, standards
Sources of knowledge	
	Data – coding, HES, pt. notes, scientific journals, databases, websites, professional bodies, voluntary orgs, Government/DOH/NHS initiatives/papers/reports Personal knowledge / expertise, research/best evidence, audit

Identifying and ‘structuring’ knowledge IC flows

- Resource mapping
- Research evidence
- Meetings/ networking
- Interviews/questionnaires/surveys
- Care pathways for all categories of patients
- EHIG Rehabilitation Codes and Definitions
- Standards, protocols, guidelines
- Head Injury Co-ordination template

Figure 3: Information systems for head injury services

views of 'evidence' (levels, validity). It was important to be aware of the differences in use and perception of knowledge between cultural groups in order to implement change. Therefore the format in which information was presented (Figure 2) was not just important, but essential to effective implementation.

The project collaboratively developed through an inclusive, iterative process, 'new' knowledge - adoption processes and planning tools to enable change to happen through networks, professional bodies and the mainstream leadership systems of the NHS. Whilst the project itself produced new knowledge, in the form of evidence for service planning, it was as much about the development of tools for future learning that would be productive for service improvement.

Tools included the development of head injury standards, using a whole systems approach, and based on a number of reports (e.g. the Galasko report[10] and later studies[29 30 31]) These are designed as a planning and evaluation tool for service planners and providers[32 33] They support and contribute to the review of quality of services within the national strategic framework[34] and the Society of British Neurological Surgeons.[35] The standards cover resources, organisation, networks, communication, facilities, guidelines, and audit. The project had found gaps in the data available and the standards set out the agreed dataset, the risk assessment process, and the requirements for information systems to ensure regular production of clinically relevant reports to support clinical governance needs.

The latter part of the project involved the rehabilitation codes. (Figure 3). A comprehensive set of rehabilitation codes help to map the key stages in recovery and rehabilitation for head injured patients. Each definition has a code, patient description, location(s) for that stage, and necessary level of rehabilitation input. The codification is linked to a set of maps showing the geographical provision of each component and also a flowchart of potential rehabilitation services. (Figure 4) They can facilitate the design of care pathways and assist in service planning for rehabilitation and follow-up by identifying gaps and variability in service provision and the likely numerical and fiscal demands on each component.

Co-ordination is crucial in provision of a service spanning specialties, organisations, and sectors. A framework for head injury coordination (Figure 5) including an accountability structure, was therefore developed as a management tool for both planners and providers to assist in identifying gaps and variability and ensure integrated service provision. The template is flexible, allowing for diversity in local resources, and adaptation to local need.

5. DISCUSSION

Structured information such as standards, guidelines, care pathway maps, and coding systems can assist in standardising processes in a way that improves coordination between providers and sectors, incorporates research findings and/or expert opinion and provides a means of service evaluation by establishing a common language and practice, processes and consistency. There are two perspectives on this: the development of the framework of tools to assist staff within the organisation with the necessary learning, and the focus on the format of the information (or data or knowledge) required for learning. Knowledge management perspectives are sometimes limited to a focus on the information management plus the sharing of expertise, but a wider perspective is that of a knowledge ecology which covers the creation, discovering, learning, sharing, evaluation, diffusion, teaching, implementation, and redirecting of knowledge (both explicit and implicit) in a systematic, purposeful and scientific way. The impacts may be viewed at several levels on people, processes, products and performance and thus the approach covers the context, the interactions (personal for trust, as well as the formal

information systems) that are necessary for translating information into actionable knowledge.[36] In this research consideration of the overall framework proceeded alongside consideration of the format and value of the information (Figure 6). The problems of getting research into practice, the problems of a sustained dialogue between the research community and the policymakers are well known in the health sector [7 8 37] but finding and implementing the solution more difficult.

Some solutions, strategies and processes in this study were (Figure 7):

1. *Enabling/facilitating communication* between different groups to develop strategies that coordinate and streamline information systems (e.g. to improve information collection for audit, which resulted in value added to information for knowledge for decision making, and at the same time enhancing collaboration, providing learning for change)
2. *Multidisciplinary, collaborative problem-focused* activities that explicitly involved practitioners and policy makers working in meaningful partnership (emphasis on finding solutions to complex problems, but at the same time enhancing collaborative learning for future service improvement)
3. *Working in contexts* where the research needs to be used (informal communication, accepting and working with existing beliefs and values).

The work also required development of mechanisms (Figure 7)[8] to kick start a virtual cycle to share ideas, raise awareness, foster problem solving attitudes, and improve practice:

4. *Development of networks* to enable active and effective dissemination of research evidence to administrative and legislative decision-makers.
5. *Development of 'new' structured knowledge frameworks* to track systems, such as the standards and rehabilitation codes. These are important in a knowledge economy context because they can facilitate the interchange of information and knowledge and coordination across boundaries and between providers and sectors.

There was a strong emphasis on learning – both for the individuals and the groups involved, and the social learning cycle proposed by Boisot[10] helps to illustrate the way the different formats of information need to be in place to make the social learning cycle work. Personal tacit knowledge about a problem needs to be discussed starts off in the concrete, uncoded, and undiffused corner of the 'information space' cube (Figure 8). Discussions are necessary to structure the problem, to make it 'codified' and to analyse it (making it more abstract). Data collection and analysis may result in a research report that represents codified, abstract, but still undiffused information. Publishing in a journal diffuses the findings but it is still not part of 'common sense' knowledge. That requires working on summaries for journals such as *Health Services Journal*, workshops to encourage individual and group learning, and a framework that encourages awareness and discussion of problems to enable the social learning cycle to operate.

One of the objectives of this study was to establish a framework for an effective head injury service spanning boundaries and disciplines. One of its strengths is in using collaborative action research. As a methodology, action research is well suited to dealing with the many challenges of participative or collaborative working, such as the conflicting views of different groups, resources, and the need to develop clear communication and information systems. Action research may be flexible, but there is a time cost involved in that, and the requirements for time, and extensive co-ordination to move through the action research cycle mean that action research rarely proceeds beyond one cycle. This project is unusual in demonstrating more than one cycle, and that might be attributed to the innovative leadership model which included the formation of a Head Injury Steering Group (Eastern Head Injury Group), the dedicated role of the Principal Researcher, and the purposeful development of a Regional Head Injury Network. The

research programme was led by a unique partnership of academic researchers, practitioners, managers and commissioners, and thus ensured every issue aspect of the service was addressed by bringing together representatives from all stakeholders, including clinicians from all specialties responsible for the care of head injuries. Membership changed to reflect the stages of the research. The EHIG developed, co-ordinated and led the strategic planning of the study, also fulfilling the vital roles of enabling, facilitating and improving communication between a number of organisations, each with their own agenda, and co-ordinating collaborative action to prevent possible wasteful duplication. In this way, an informal but focussed network for Head Injury was developed allowing effective solutions to complex issues and problems.

Bate and Robert[7] suggest that the weaknesses of the NHS Collaboratives concerned: 1) a focus on data and information, rather than knowledge; 2) adaptation of knowledge rather than generation of knowledge; 3) an emphasis on evidence (explicit) rather than tapping experience; and 4) emphasis on the formal network rather than encouraging communities of practice. In short, a top-down approach may be counter productive, and the Collaboratives need to be more democratic, and to be self-organising. Actor-network theory emphasises the process of translation, and would lend itself to the study of the self-organisation and change. For this particular project, there was, however, a vision to be attained for improved head injury services, and the participatory action research perspective fitted the values of NHS staff involved. The information systems developed for the project fitted around what was there, of necessity perhaps, but staff were encouraged towards generation of knowledge both for themselves and for sharing with others. Much of the analysis and reflection required consideration of the ways in which barriers to change could be reduced, and how the levers for change could be promoted. This allowed the integration of new policy initiatives from Department of Health into the work of the project. For example, the introduction of the NICE guideline on Computerised Tomography (CT) scanning would have had major resource implications for the Region. A trial in one hospital led to the development of a modified 'Cambridge' protocol for CT scanning that follows the NICE guidelines, but has been modified for night-time periods. The development of the "Cambridge protocol" is an example of replacing current practice with a safe modified version to allow for resource limitations within individual departments, and one that is acceptable to other members of the network who have been kept informed about the developments. Case studies of management consultants working on knowledge transfer suggest that credibility is important – and that there are four dimensions to credibility.[38] These are the scientific credibility (accuracy of the data), the expertise of the communicator, the authority of the communicator, and the neutral stance of the communicator. In the Eastern Head Injury Framework work, there was an emphasis on obtaining, and generating accurate data, and information for planning. The co-ordinator role was key in providing a neutral, but authoritative perspective on the research, and that role has developed as the project progressed.

6. CONCLUSIONS

In the process of developing the regional framework for head injury, many information collection, analysis, dissemination and knowledge sharing activities were involved. The complexity of the exercise was akin to running a military campaign but without the advantage of expecting obedience to commands. Dealing with different professional groups requires a different set of skills, and the action research approach should help those involved to learn for themselves, and contribute to the knowledge base for the project. The action research approach provided a sound philosophical framework but there should be no illusions about the time and commitment required to proceed through the cycles. In this case the action research approach worked, and the knowledge network operates successfully, and future work is planned. This was, and is, a large project, and probably the main transferable lesson is the importance of good co-ordination, and the key role of a co-ordinator in liaison, setting up workshops, initiating discussions and

doing much of the data collection and analysis involved. For projects with less time, that project management and co-ordination role is still vital but perhaps the main lesson is that the period of reflection and consideration is necessary before embarking on change. The data collection, analysis, and discussion within the setting are part of the process of engagement and awareness, a very necessary part of planning.

Many action research projects cannot proceed through the cycles as project resourcing levels are not adequate, or not sufficiently reliable to see the projects through more than one cycle. This project was fortunate in obtaining reasonably assured levels of funding throughout and that has probably been a factor in enabling the co-ordination and networking, and knowledge transfer.

Many initiatives to disseminate evidence and 'best practice' concentrate on the different formats, the different levels of evidence, but there is less emphasis on how these inter-relate and how each may contribute to enabling learning at individual and at group level. The project demonstrated that an understanding of the social learning cycle can help in understanding how the pieces fit together, and how the information systems need to be in place to provide the information (or data or knowledge) in the appropriate format, to make the learning possible.

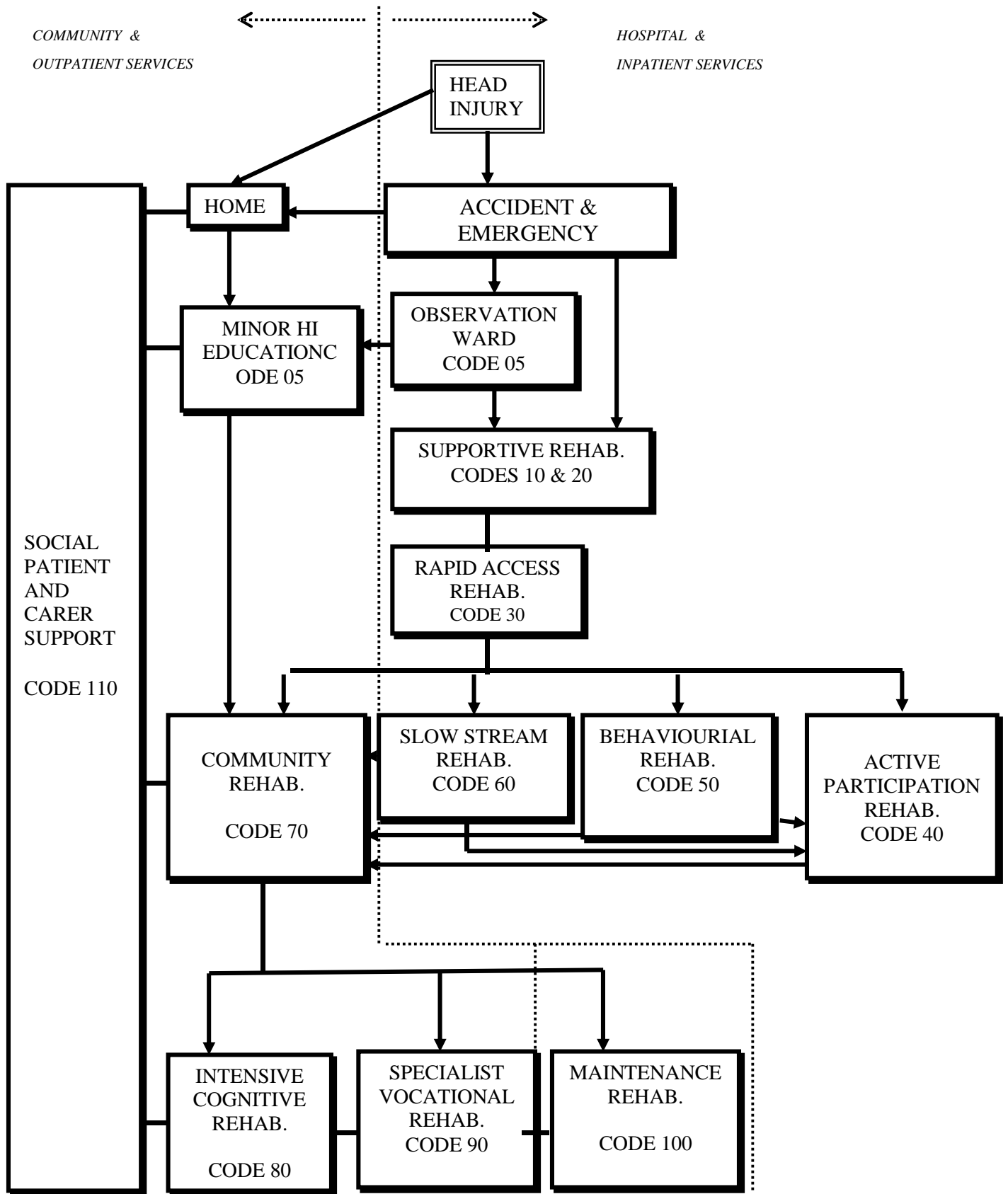


Figure 4: Flowchart of potential rehabilitation services linked to EHIG coding

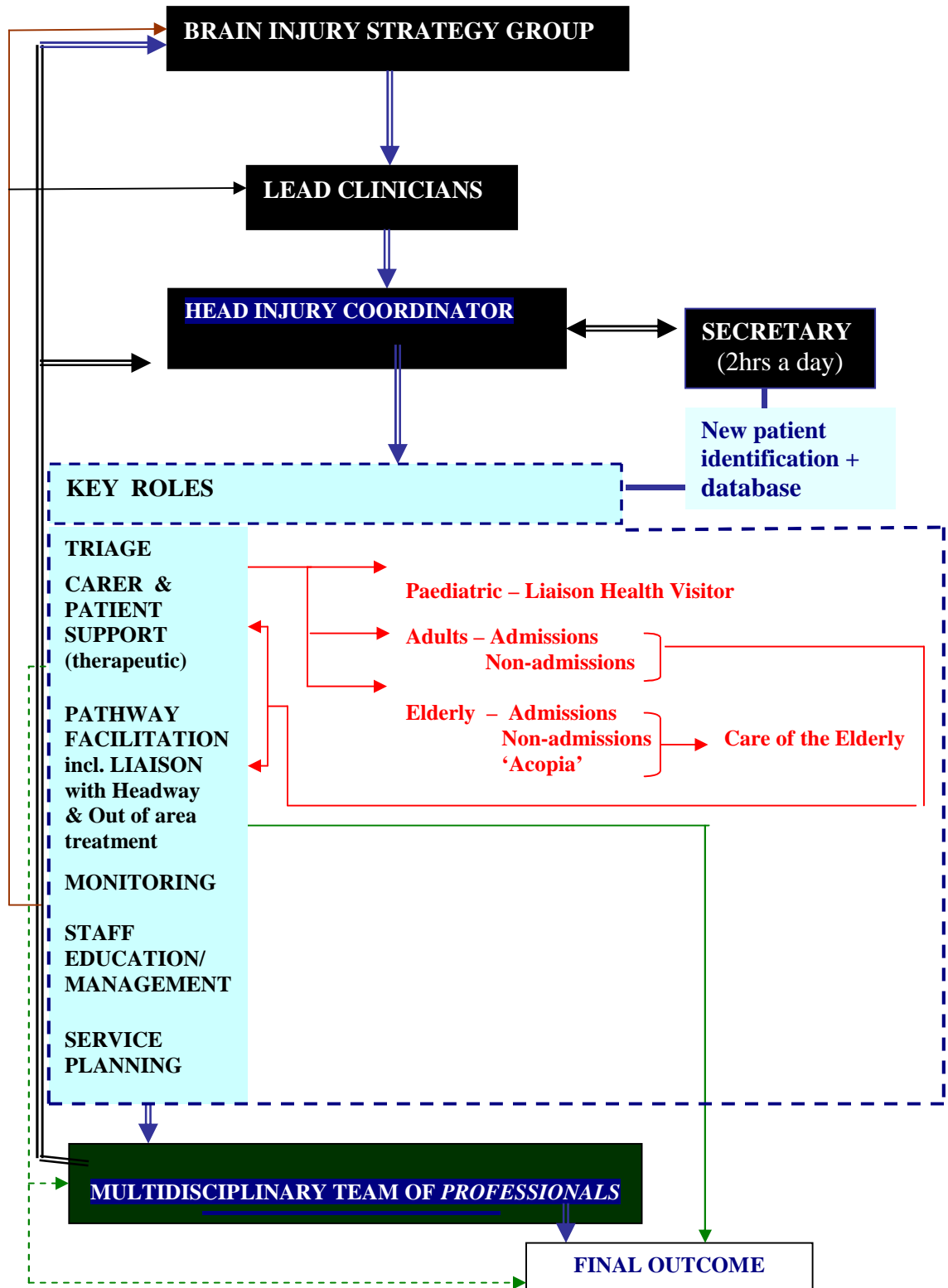
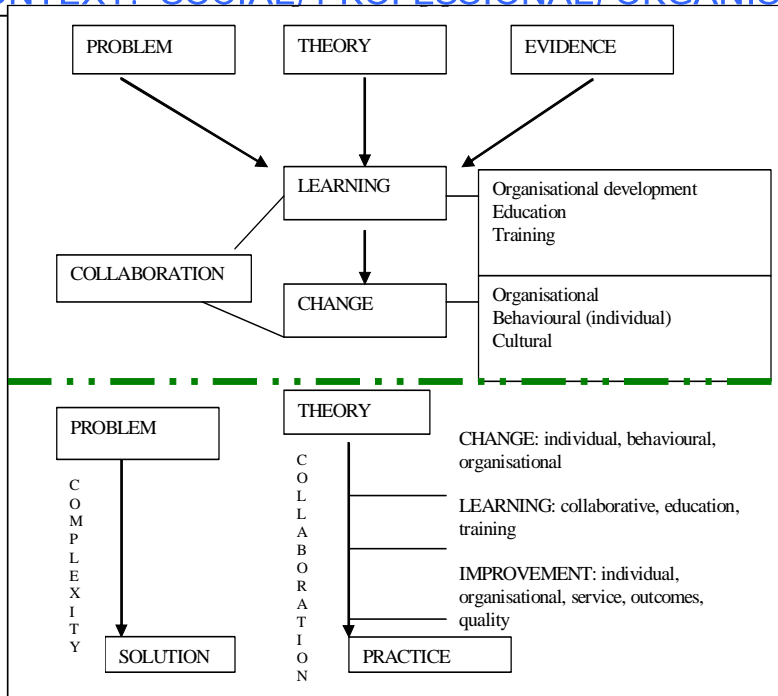
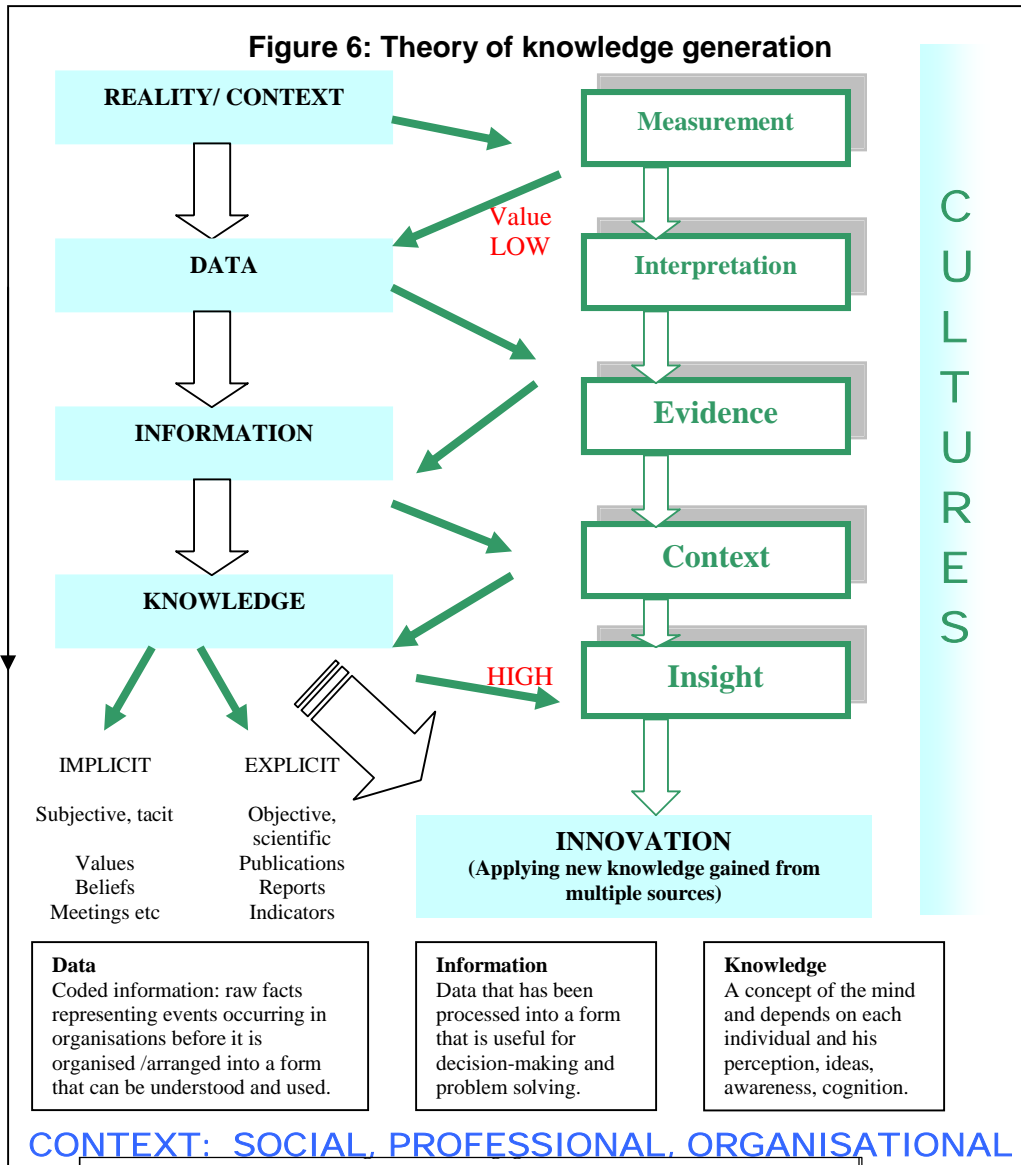
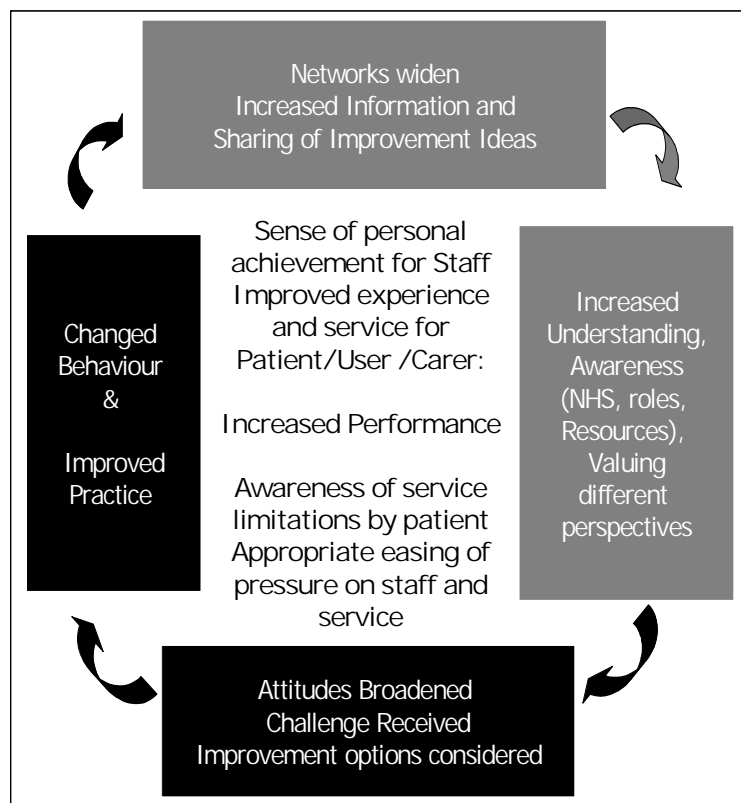


Figure 5: Head Injury Co-ordination Template

Figure 6: Theory of knowledge generation





Change in thinking, practice and culture seems to be stimulated by networking, sharing knowledge and experiences, amongst staff and across organisations and sectors, thus seeing the 'wider picture'. The increased education and information sharing released understanding and new perspectives on the situation and services.

Figure 7: The role of networks in change in practice and cultural change⁸

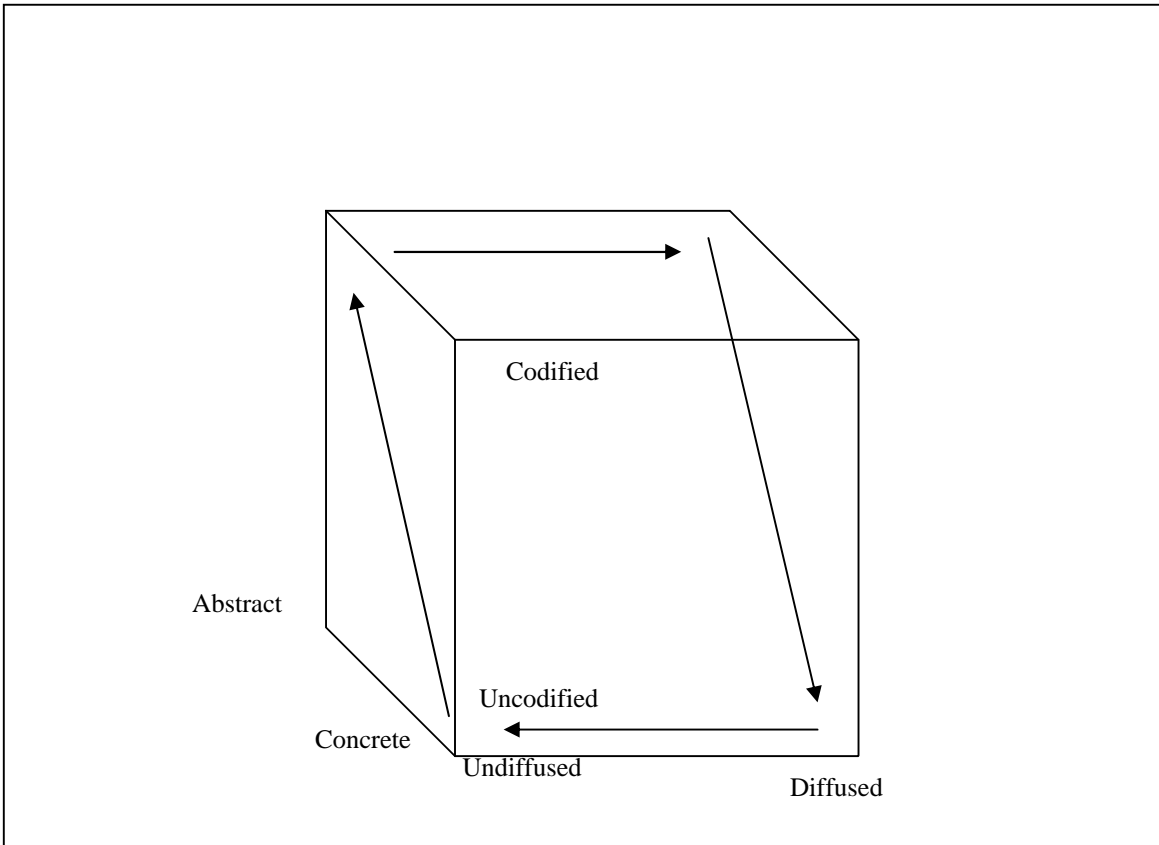


Figure 8: Knowledge diffusion and the social learning cycle (adapted from Boisot, p.59)

References

- [1] Rogers CR, Freiberg HJ *Freedom to learn*. London: Prentice Hall, 3rd rev ed; 1994.
- [2] Lave J, Wenger E. *Situated learning: legitimate peripheral participation*. Cambridge: CUP; 1990.
- [3] Wenger E. *Communities of practice: learning, meaning and identity*. Cambridge: CUP, 1998.
- [4] Cooper J, Spink S, Thomas R, Urquhart C. *Evaluation of the Specialist Libraries/Communities of Practice. Report for National Library of Health*. Aberystwyth: Department of Information Studies; 2005, available from <http://cadair.aber.ac.uk>
- [5] Russell J, Greenhalgh T, Boynton P, Rigby M. Soft networks for bridging the gap between research and practice: illuminative evaluation of CHAIN. *BMJ* 2004; 328(7449):1174-1179.
- [6] Department of Health. *The NHS plan: a plan for investment: a plan for reform*. London: Department of Health; 2000.
- [7] Bate SP, Robert G. Knowledge management and communities of practice in the private sector: lessons for modernizing the National Health Service in England and Wales. *Public Administration* 2002; 80(4):643-663.
- [8] Lomas J. *Improving research dissemination and uptake in the health sector: beyond the sound of one hand clapping*. Hamilton, Ontario: McMaster Centre for Health Economics and Policy Analysis; 1997.
- [9] Elliott H, Popay J. How are policymakers using evidence? Models for research utilisation and local NHS policymaking. *J Epidemiol Commun Health* 2000; 54(6):461-468
- [10] Boisot MH. *Information space: a framework for learning in organizations, institutions and culture*. London: Routledge, 1998.
- [11] Banks P. *Partnerships under pressure*. London: King's Fund, 2002
- [12] Bate P, Bevan H, Robert G. Towards a million change agents: a review of the social movements literature: implications for large scale change in the NHS. NHS Modernisation Agency, Sept.2004.
- [13] Matrix Research and Consultancy. *What is transformational change?* NHS Institute for Innovation and Improvement, URL: <http://www.institute.nhs.uk/> accessed 8 March 07.
- [14] Peckham M. Developing the NHS: a model for public services. *The Lancet* 1999;354: 1539-1545.
- [15] Whyte W. *Participatory action research*. New York: Sage; 1991.
- [16] Lewin K. Group decision and social change. In *Readings in social psychology* (Eds. TM Newcombe, EL Hartley). New York: Holt; 1947.
- [17] Hart E, Bond M. *Action research for health and social care: a guide to practice*. Buckingham: Open University Press; 1995.
- [18] Cockburn L, Trentham B. Participatory action research: integrating community occupational therapy practice and research. *Can J Occup Ther* 2002; 69(1):20-30.
- [19] Castells M. Towards a sociology of the network society. *Contemporary Sociology* 2000; 29(5):693-699.
- [20] Chambers R. *Whose reality counts? Putting the first last*. London: Intermediate Technology Publications; 1997.
- [21] Reason P, Bradbury H. (Eds.) *Handbook of action research*. London: Sage; 2001.
- [22] Orlikowski W. Improvising organizational transformation over time: a situated change perspective. *Information Systems Research* 1996; 7(1):63-92.
- [23] Tatnall A, Gilding A. Actor-network theory and information systems research. Proceedings of the 10th Australasian Conference on Information Systems, 1999, p.955-966.
- [24] Royal College of Surgeons (Ed. Galasko). *Report of the working party on the management of patients with head injuries*. London: RCS; 1999.

-
- [25] Dixon-Woods M, Agarwal S, Jones D, Young B, Sutton A. Synthesising qualitative and quantitative evidence: a review of possible methods. *J Health Serv Res Policy* 2005; 10: 45-53.
- [26] Pickard J, Seeley H, Kirker S, Maimaris C et al. Mapping resources for head injury. *Journal of the Royal Society of Medicine* 2004;97(8):384-9.
- [27] Eastern Head Injury Group, URL: <http://www.ehig.org.uk> accessed 6 March 07
- [28] Seeley H. Developing services for head injury: obtaining the data. *Health Informatics J* 2007;13(2): 135-53.
- [29] British Association of Accident and Emergency Medicine. *Implementing the Galasko Report on Head Injury Care – implications for A&E departments*. London: BAEM; 2000.
- [30] Society of British Neurological Surgeons. *Safe neurosurgery 2000*. London: SBNS, 2000.
- [31] British Society of Rehabilitation Medicine and Royal College of Physicians. *Rehabilitation following acquired brain injury: national clinical guidelines*. BRSM, Dec 2003
- [32] Seeley H, Maimaris C. & Eastern Head Injury Group. Standards for head injury and the NSF for Long-term Conditions. *Health Service Journal* May 13th 2005.
- [33] Seeley H, Maimaris C, Hutchinson P, Carroll G et al. Standards for Head Injury management in acute hospitals: evidence from the 6 million population of the Eastern Region. *Emerg Med J* 2006;23(2):128-32.
- [34] Department of Health. *National Service Framework for Long-term Conditions*. London: DOH; 2005.
- [35] Society of British Neurological Surgeons. *Standards for Patients Requiring Neurosurgical Care. Joint Standards Development Group of the Clinical Standards Committee of the Society of British Neurological Surgeons*, Aug.2002.
- [36] Ho D, Peng S, Lai A, Chan S. Indigenisation and beyond: methodological relationalism in the study of personality across cultural traditions. *J Personality* 2001; 69(6):923-953.
- [37] Hunter D. Evidence-based policy and practice: riding for a fall? *J R Soc Med* 2003; 96:194-196.
- [38] Jacobson N, Goering P. Credibility and credibility work in knowledge transfer. *Evidence & Policy* 2006; 2(2):151-165.