



Article

Evaluating the Development of Virtual Communities of Practice that Support Evidence Based Practice

Christine Urquhart
Senior Lecturer
Department of Information Studies
Aberystwyth University, United Kingdom
Email: cju@aber.ac.uk

Anne Brice
Department of Knowledge & Information Sciences
Public Health Resource Unit, Oxford, United Kingdom
Email: anne.brice@dphpc.ox.ac.uk

Janet Cooper
Department of Information Studies, Aberystwyth University
Aberystwyth, Wales, United Kingdom

Siân Spink
Department of Information Studies, Aberystwyth University
Aberystwyth, Wales, United Kingdom

Rhian Thomas
Department of Information Studies, Aberystwyth University
Aberystwyth, Wales, United Kingdom
Email: ret@aber.ac.uk

Received: 01 Dec. 2009

Accepted: 12 Feb. 2010

© 2010 Urquhart, Brice, Cooper, Spink and Thomas. This is an Open Access article distributed under the terms of the Creative Commons-Attribution-Noncommercial-Share Alike License 2.5 Canada (<http://creativecommons.org/licenses/by-nc-sa/2.5/ca/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly attributed, not used for commercial purposes, and, if transformed, the resulting work is redistributed under the same or similar license to this one.

Abstract

Objective – The aim of this paper is to examine how virtual community of practice principles might be used by information professionals with emphasis on the work of the Specialist Libraries for health professionals in England, UK. An evaluation conducted in 2004-2005 examined the operation of the Specialist Libraries, which the

National Library for Health had contracted out to various organisations, and assessed their stage of development as communities of practice.

Methods – Evaluation methods included observation of a meeting of information specialists, interviews with clinical leads and information specialists, and evaluation of the content and format of the Specialist Library websites. The evaluation framework was based on a systematic review of the literature to determine the critical success factors for communities of practice and their role in supporting evidence based practice. An updated literature review was conducted for this paper.

Results – Operational structures varied but were mostly effective in producing communities of practice that were at an “engaged” stage. Some Specialist Libraries wished to move towards the “active” stage by supporting online discussion forums, or by providing question and answering services or more learning activities and materials. Although the evidence from the literature suggests there are few clear criteria for judging the effectiveness of communities of practice, the evaluation framework used here was successful in identifying the state of progress and how information professionals might approach designing virtual communities of practice.

Conclusions – Structuring library and information services around community of practice principles is effective. Careful and participative design of the information architecture is required for good support for evidence based practice.

Introduction

The NHS Evidence Health Information Resources website (formerly the National Library for Health, NLH and National Electronic Library for Health, NeLH) aims to deliver health library services to NHS staff, students, patients and carers in England, and to support and promote evidence based decision making. At the time of the empirical research described in this paper, the aim was to offer a range of services that mixed traditional services, such as professional librarian support, with new web based services such as a comprehensive search engine, clinical question answering, and current awareness services.

A major component of the NLH portal, the Specialist Libraries section, was established in 2003 to make it easier for distinct health care communities to access and transfer knowledge. Specialist Libraries were based around three types of specialty: disease groupings (e.g., cancer, cardiovascular or skin diseases), populations (e.g., children or older people), and different types of healthcare

activity (e.g., complementary medicine or clinical genetics). Specialist Libraries (now renamed Specialist Collections) aim to identify and engage all key stakeholders and partners.

Definitions of communities of practice vary, but one main proponent, Wenger (1998), emphasises how communities of practice foster social learning – learning that takes place within practice, based on observation and interactions (p. 96). The NLH’s aim, via the Specialist Libraries, was to ensure that practitioners in different specialties could make sense of evidence based practice in ways that were meaningful to them, and apply lessons learned by others in their specialist area. While many private sector organisations have embraced communities of practice as a way of preserving and fostering knowledge, large public sector organisations such as the National Health Service (UK) seem to have been slower in adopting these knowledge management solutions. The Specialist Libraries were designed on evidence based principles to ensure that as far as possible they worked as communities of practice should. The findings of an evaluation conducted by

the Aberystwyth University in 2004-2005 were intended to identify the barriers and enablers to further the development of the Specialist Libraries as communities of practice. This paper outlines how those principles were derived, how the evaluation was conducted, and the main findings. Discussion and conclusions emphasise lessons that may be transferred to other information services and health organisations, using the findings of a review of the literature as well as the study results.

Aims, Objectives, and Context

The aim of the evaluation was a mid-term review of the development of the Specialist Libraries. The primary objectives were to assess whether the 19 Specialist Libraries were operating as intended, whether they were developing as communities of practice, and what stage they had reached. Secondary objectives included examining how the information specialists supporting the Specialist Libraries were themselves operating as a community and to examine the links between the Specialist Libraries and other health organisations such as professional bodies and patient support groups (their advisory group structure).

Some of the Specialist Libraries had been formed in 2004, others had been in existence for at least three years (operating as "Virtual Branch Libraries" within the NeLH). Their structures varied slightly according to their host organisation, but the usual management team for a Specialist Library had a clinical lead, an information specialist, support by an Editorial Board to help appraise quality and approve content development strategies, and a reference group of other organisations and groups (including patient support groups) with an interest in the clinical speciality. Some information specialists supported more than one Specialist Library.

Methods

The methods used for the evaluation included:

- Revalidation of framework criteria for appraising the websites of the Specialist Libraries (details below)
- Evaluation of the 19 websites against the framework criteria to determine the stage of development
- Interviews with Specialist Library teams – clinical leads (1 face-to-face interview, 3 telephone interviews) and information specialists (4 face-to-face interviews, 2 telephone interviews, plus one set of replies emailed back).

Interviews were intended to complement the website evaluations and provide answers to some of the questions concerning future development plans. Questions (Appendix 1) explored perceptions of clinical leads and information specialists about the functioning of their Specialist Library, how the management structures operated, and what their priorities were. Interviews were transcribed and coded according to the evaluation framework themes.

In addition, one member of the research team attended the information specialists' meeting in Bath from 8-9 December, 2004 for observation and background fact finding. In total, 10 of 19 Specialist Libraries were approached for more formal interviews, and 10 supplied information. A selection matrix was used to ensure that the sample included old and new libraries, various organisational set-ups, and clinical communities (e.g., chronic conditions, acute specialities). Several of the information specialists service more than one Specialist Library and the interviews with those information specialists sought comparisons with the work they did for both Specialist Libraries.

Developing and Revalidating the Framework Criteria

We believed two key concepts for communities of practice were important for the health sector. These were: 1) legitimate peripheral participation (Lave & Wenger, 1991): and 2) the possible membership an individual might have in several communities

of practice (Wenger, 1998, p. 158). Any health community of practice needs to allow for new members, such as those on clinical rotations to participate on the fringes initially, but still to recognise them as legitimate members of the virtual community. In addition, health professionals may belong to several communities, representing their various professional and research interests. An earlier study had developed an evaluation framework, based on a systematic review of the literature (Urquhart, Yeoman, & Sharp, 2002). The review identified community of practice evaluations through Web sites (White, 2001), literature searches (1995-2001) on databases (ISI Social Citation Index/Web of Knowledge) using search terms such as knowledge management, communities, organisational learning and social learning. It established that most evaluations of community of practice projects have used a variety of methods to provide triangulation of the findings (mostly qualitative). One longitudinal five-year study by Gongla & Rizzuto (2001) used participant observation, activity measurement and structured interviews. Other approaches include the case study approach (Hildreth, Kimble, & Wright, 1998); focus groups plus quantitative methods (Moreno, 2001); action research (Catino, 1999); the American Productivity Quality Council benchmarking methodology (O'Dell, Hubert, & McDermott, 2001); and a social capital framework (Lesser & Storck, 2001). Although many of the studies included for further review used triangulation to support conclusions drawn, none included sufficient raw data to enable verification of the interpretations and conclusions made.

The key themes to emerge from this synthesis of the research evidence were:

- Virtual communities may be constituted formally or informally.
- Trust often needs to be fostered through face-to-face communication, and trust is often consolidated through working on a shared document or task.

- Communities of practice may evolve through stages, but not necessarily in true life cycle format. (Moreno, 2001)

The stages of evolution identified in the major longitudinal study in IBM (Gongla & Rizzuto, 2001) are:

- Potential (connecting individuals)
- Building (allowing individuals to learn more about each other, share experiences and knowledge, create shared norms)
- Engaged (emphasis on access and learning to provide support to new members and add to the knowledge base)
- Active (emphasis on collaboration and shared work tasks)
- Innovation and Generation (to develop new products and services and even to spawn new communities of practice).

By 2001, there had been some community of practice trials (e.g., Lau & Hayward, 2000) in the health sector. The limited evidence from these indicated the importance of building trust. The infrastructure or learning architecture for a community of practice (Wenger, 1998, p. 230) should allow for engagement (e.g., shared repositories, storytelling, joint tasks), imagination (e.g., scenario development, explanations and examples), and alignment (e.g., feedback and audit mechanisms, mediation mechanisms). The review demonstrated that the activities, documents, and processes within a community of practice would need to cater for the differences in perspective (Markus, 2001) between novices, expert practitioners, researchers and those involved in secondary knowledge production (e.g., in systematic reviews). A synthesis by Nutley & Davies (2001) of various approaches to organisational learning, as applied to the NHS, contrasts the emphasis on the codification of knowledge, as shown in standardised reporting schemes, and publication of guidelines with the "unlearning" processes required to change established practice in the light of new

evidence. For the health sector, as in other communities of practice, power and politics cannot be ignored (Fox, 2000), and assumptions about norms of behaviour and responsibilities for changing practice need to be considered.

Most of the published qualitative studies on which the appraisal framework (below) was based would not meet all the criteria for reporting qualitative research, as details were lacking. Nevertheless, the framework was successful in identifying that the "Virtual Branch Libraries" were functioning as communities of practice (Urquhart et al., 2002) and therein to inform the specification for commissioning the Specialist Libraries in 2003.

Updated Literature Review

The literature review was updated for this evaluation (2004-2005) to identify trends in social learning theories, recent community of practice evaluations in the health sector, and other related systematic reviews. No changes to the original framework were deemed necessary.

More recent literature, published since the original (2001) and updated (2004) synthesis for the evaluation work was identified through a literature search of MEDLINE (using PubMed related article searching) and Web of Knowledge and by following up references in relevant articles. This time, the inclusion criteria were narrowed to systematic reviews of communities of practice in the health sector, comparative case studies, research studies that included virtual and face-to-face communities of practice for health professionals, and theoretical frameworks that might be applied to virtual health communities of practice (2004- mid 2009 publication date).

Several systematic reviews were identified. Li et al. (2007) compared business and health communities of practice, but found no evaluation studies in the health sector that fitted their inclusion criteria. Their synthesis of literature (1991-2005) identified four important

characteristics: social interaction among members, knowledge sharing, knowledge creation, and identity building – but these are not consistently present in all communities of practice. Eysenbach, Powell, Englesakis, Rizo, & Stern (2004) systematically reviewed the effects of online peer-to-peer interactions in virtual health communities of practice and electronic support groups, but found no robust evidence. An ongoing Australian study (Braithwaite et al., 2009) did a content analysis (Greenfield, Travaglia, Nugus, & Braithwaite, 2007) of the 624 publications on health systems communities of practice identified in their systematic review, which will contribute to an evaluation methodology with evidence based outcome measures for communities of practice and social networks. A systematic review (Fung-Kee-Fung et al., 2008) of regional collaboratives in surgery identified five enablers for effective learning for best practice (establishment of trust, reliable data, clinical leadership, institutional support, and an infrastructure for quality management).

Dubé, Bourhis, & Jacob (2005), in a qualitative analysis of 14 organisations (comparative case study) developing virtual communities of practice found that relevance, and a facilitating environment were vital. Although intentionally formed communities may fail and face-to-face communication is important for initial socialization, it is not necessary to build on existing informal networks. In addition, the benefits of voluntary versus mandatory participation are unclear.

Some of the themes that emerge from these studies – the evolving definitions of communities of practice and the difficulty of evaluating complex adaptive systems that do not behave in a linear fashion, are echoed by qualitative research by Ferlie, Fitzgerald, Wood, & Hawkins (2005), whose analysis of eight comparative case studies indicated that tight professional boundaries may inhibit the spread of innovations in evidence based practice. Innovation is not necessarily a neat linear process, particularly as some professional networks may operate horizontally (between colleagues) and others

vertically (senior to junior staff) (Greenhalgh, Robert, MacFarlane, Bate, & Kyriakidou, 2004).

From the literature retrieved in the initial and updated review, evidence was collated to inform questions for this paper about the design approach for communities of practice, development risks, and how effectiveness might be evaluated. The key themes are, with the type and level of evidence indicated, are:

- Contingent approaches to design are desirable for trust and knowledge sharing to develop. IT-led communities may be more difficult to engineer than IT-supported communities (Kling & Courtright, 2003), and even in carefully constructed knowledge networks exposing gaps in knowledge can seem risky (Falkman, Gustafsson, Jontell, & Torgersson, 2008). Benefits of knowledge sharing need to be clear and norms of behaviour in virtual communities apparent (Giordano, 2007). Russell, Greenhalgh, Boynton, & Rigby (2004) indicate that the success of an informal email network to support evidence based care depended on careful targeting and filtering of messages.
Level of evidence: mainly qualitative analysis
- The ways of working and professional practice and learning may adversely affect multidisciplinary communities of practice (Ferlie et al., 2005). Different types of informal learning exist, and the concept of “situated learning” needs to be reviewed (Eraut, 2000). Forums which are ostensibly multi-professional are in fact medical (Dopson, Fitzgerald, Ferlie, Gabbay, & Locock, 2002). Group dynamics, and the different ways in which doctors and nurses may value important knowledge may affect a multidisciplinary community of practice in unpredictable ways (Gabbay et al., 2003).

Level of evidence: theoretical opinion, and mainly qualitative analysis

- Legitimate peripheral participation and power relations are tricky. Experts can also learn from the novices (Fuller, Hodkinson, Hodkinson, & Unwin, 2005), but power relations (Fox, 2000; Li et al., 2007) may complicate matters, and marginal membership may disadvantage some (Mallinson, Popay, Kowarzik, & Mackian, 2006).

Level of evidence: systematic review, plus qualitative analysis

- Criteria for success of communities of practice are elusive (Eysenbach et al, 2004; Li et al., 2007), perhaps because they are complex adaptive systems (Greenhalgh et al., 2004; Sheffield, 2008).

Rigorous experimental evidence is sparse, although one randomised controlled trial (Barwick, Peters, & Boydell, 2009) and a pre-test, post-test design (Tolson, Booth, & Lowndes, 2008) suggest that members of a community of practice group are more positive in attitude towards a change in practice, more knowledgeable, and willing to take decisions independently.

Level of evidence: systematic reviews, plus single randomised control trial

Web Site Appraisal

For each of five critical success factors identified by the NLH team commissioning the research, appraisal questions were developed (Figure 1, for an outline list). These questions were based on the evidence from the original systematic review (Urquhart et al., 2002) and were also relevant to the processes and enabling technology of interest to the NLH. Questions probing the stage of development were based on the most rigorous evaluation of communities of practice identified (Gongla & Rizzuto, 2001) as Figure 2 illustrates for the usability critical success factor.

Website appraisals were completed for the 19 Specialist Libraries in existence in late 2004. Copies of the individual completed appraisal forms were sent to the relevant information specialists for verification by their core team, and amendments made as necessary.

Results

Stage of Development

The stages of development are characterised as follows:

1. Building stage (Constructs communal memory and context: learning about one another; building a common vocabulary; creating roles; beginning repertoires)
2. Engaged stage (Promotes access and learning: building trust, loyalty, and commitment; providing outreach; telling community stories; encouraging contribution to the knowledge base)
3. Active stage (Supports collaboration: engaging members in work groups or collaborative working with others; using analytical and decision-making tools)
4. Adaptive stage (Creates new products: founding of more communities; responding to environmental changes)

Critical success factor	Questions
Functionality	1. Are the purpose, aim, and identity clear? 2. Are there ways of identifying and locating community members? 3. Is there a clear knowledge management framework, common repository? 4. What functions support newcomers, or visitors? 5. How are evaluation, audit, and community "sensing" achieved? 6. How are links with other groups, and organisations presented? 7. How might policy making in the Department of Health be supported?
Usability	1. How are individuals brought together? 2. Are the roles of participants and the norms of behaviour clear? 3. Is the organisation of knowledge appropriate to the community? 4. Does the process of feedback work transparently?
Content	1. Are there directories of members or equivalent? 2. Does the range of content include document and library systems, community "stories", record of collaborative work efforts? 3. Are there decision making and analytical tools to support application of the content? 4. Are there links with other systems in the workplace, such as the Electronic Patient Record?
Stakeholder involvement	1. What types of participation are possible, and can participants (professional societies, patient groups, research workers, charities, commercial organisations) move to a level of participation appropriate to their needs? 2. How is personal identity and communal identity supported? 3. Are the rhythm of events, news for the workplace reflected? 4. What rewards of membership are apparent? 5. What types of collaborative interaction might be supported? 6. What type of mentoring is available? 7. How is primary care taken into account? 8. Are patients stakeholders, and what might be the relationship with NHS Direct Online or similar?
Project management	1. How is "senior management" represented? 2. Is there a core of community leaders? 3. How is leadership interpreted? 4. What evaluation mechanisms exist, and how are they acted on? 5. How are diverse roles identified and represented? 6. What mechanisms are there for building trust among community members?

Fig. 1. Website appraisal framework.

Rationale	Stage Characteristics
1. How are individuals brought together?	<i>Potential stage.</i> Some evaluations stress need for relationship development, some outreach from existing teams, and virtual working an important consideration for professionals used to face-to-face communication
2. Are the roles of participants and the norms of behaviour clear?	<i>Building stage.</i> Need for consideration of potential computer mediated communication problems in the health sector, different genres of communication among different professional groups
3. Is the organisation of knowledge appropriate to the community?	<i>Building to Engaged stages.</i> Some possible uncertainty about the formats appropriate for different professional groups
4. Does the process of feedback work transparently?	<i>Engaged to Active stages.</i> Helping to support change in practice, and organisational learning

Fig. 2. Mapping of web site usability criteria to stages identified in the Gongla & Rizzuto review.

These stages of development are the same as used in the previous evaluation (Urquhart et al., 2002). Some of the Libraries were found to be mid-way between stages, making it difficult to indicate how many were at each stage. For example, some of the older established Libraries were, unsurprisingly, more advanced than those newly established in 2004 (e.g., Cancer, Oral Health, Later Life). And as might be expected, there were signs of change with different parts of the same library showing signs of operating at different stages. In one Specialist Library the user group was at the building stage, but their UK-wide steering group was well into development of the active and adaptive stages of community of practice development.

All the Specialist Libraries fulfilled the criteria for the building stage and most were at the

engaged stage, but were developing in different ways. The way feedback was handled differed across the Libraries, although the value of contributions from users was acknowledged as a virtual circle:

We send items out to our stakeholders who are the experts in the field and say - should this still be in the Library? The more that we can get the stakeholders and the user involved... you want people to be looking at the site, and they will say - look, this is now out of date... And that's starting to happen.

Most of the Specialist Libraries were stuck at the engaged stage, as the Resource Management System (RMS) introduced by the NLH for use by all the Specialist Libraries for the architecture of the virtual community of practice did not provide the required functionality to support some types of collaborative working and discussion as easily as it might. Unlike many of the communities of practice in the private sector, the Specialist Libraries did not "tell community stories" (as might be expected of the engaged stage) but they did provide access to clinical guidelines and other procedural knowledge – perhaps a very formalized way of documenting "how things are done around here and why."

Building trust and loyalty (in the engaged stage) was characterised by concern about providing a quality product valued by the community, and one that the community would contribute to, in some way. As libraries expand the content it is likely that the number of clinical "leads" or at least the need for varied clinical input increases, particularly if there is a great emphasis on quality assurance processes.

I think we've invested quite a lot of time in the quality assurance of things...of guidelines that we're going to put on and that's why it's taken us.... 18 months developing the clinical library...Recently I've had more clinical input, we've divided the library up so we've got other clinicians

involved more. So I'm doing far more of the sort of overview.

One of the more established Specialist Libraries viewed their role in the active stage as the integration of the smaller "communities of practice" in their area. This included specialist interest groups and professional groups, represented through their advisory group structure. They stress collaboration but *"We try hard not to be seen as competition with the specialist societies."*

Some Specialist Libraries viewed their role as helping their community make decisions quickly, which included convenient provision of digests or summaries of the content that might already be on the NLH site (such as NICE guidelines or Cochrane Reviews) but is dispersed and therefore harder to locate.

If a NICE guideline is difficult for somebody to use because it's an 80 page Word document then there's not much we can do about that...I suppose what Specialist Libraries are doing, is that we are trying to present critically appraised abstracted versions of content to give people a way into some of those more difficult to use resources. That's something we're working on as well.

Benefits and Drawbacks of a Community of Practice "Brand"

Several of the interviews revealed the tension between providing a recognisable NLH-branded service, with a standardised Resource Management System, and a community of practice that was relevant to the needs of that community. For some Specialist Libraries, this spelt problems for the trust they had built up with their users: *"You're faced with a community of users who have seen the functionality go with no extra, no real extra content."* Experimentation with RSS (Really Simply Syndication) feeds was acknowledged as useful, if not vital, in supporting current awareness services, but there were some misgivings at the time that some user-led needs analysis had not been fully integrated in the timescale expected.

Opinions varied about the desirability of standardisation. Some want complete standardisation, others want control of their front page, or some degree of flexibility. The Resource Management System (RMS) provides some advantages for the information specialists in helping to crosslink to other Libraries' information or other NLH evidence resources.

There was a perception that the RMS and the RSS feeds were very good at helping with the information management, but that the support of the community of practice would need more emphasis on learning. Some interviewees noted that the current configuration of the RMS prevented them from putting on material that would suit the newly qualified or visiting staff – those who might be "legitimate peripheral participants."

Sub-groups of information specialists, under the aegis of the NLH, were tasked to formulate guidance on standards and presentation, training and development, evaluation, and publication types on behalf of all the Libraries. The interviews confirmed that there had been problems with technical guidance and support, but that an appointment of a co-ordinator at the NLH end, and easier reporting (and better response rate) for technical problems had helped improve the situation.

The information specialists were helped through the problems of implementing the RMS by their own network. *"We can actually have an electronic community of all the Specialist Libraries' staff so we can collaborate and have online discussions, file sharing, post events, have some statistics on the electronic community."* Those based near each other geographically have close working relationships: *"And that's a kind of group therapy session as much as anything else. We get together and talk about some of the difficulties involved in producing these Libraries."* This community of practice of information specialists, working to support the Specialist Libraries, was operating very successfully.

Support of Social Learning

At the time of evaluation, several information specialists and clinical leads discussed how to get their communities involved in activities that would be viewed as social learning, although only a minority offered access to training materials. The organisational framework for the social learning is the reference group or advisory group of professional organisations, relevant charities, and patient support groups. Within that large group there may be a core group of people who contribute regularly to the work of the Specialist Library. Activities such as sharing in appraisal of material for the Web site would build the community, but would also require some intrinsic rewards: *"My personal view is that we're unlikely to get anyone with the right expertise to quality appraise anything for us for no academic credit or reward whatsoever."* On the other hand involving clinical students who are trained in critical appraisal in this type of content selection as *"something that is done"* may help as *"They are the people we can influence most and that could be done cheaply and easily...they will be our main users in the future."*

Routes to capitalise on what people already do, to use that as a scaffold to extend the work of the community of practice in the Specialist Library, include working with existing journal clubs: *"At the moment we're trying to get links into things like journal clubs in teaching hospitals."* Some Specialist Libraries see the job of supporting the Specialist Libraries as something professionals should accept as part of their role, and would become ingrained during professional education and training.

What we want them to do is to let us know they read something interesting and to provide us with a quality assessment of that. They're doing it all the time, they should be doing it to the people they're training, their junior staff, they're doing it for journals, what we do is provide them with materials so they can provide us with their opinion online.

Discussion

Most evaluations of communities of practice have been conducted, as this one was, using qualitative research methods, to understand how the communities were operating. The framework devised was effective in highlighting some of the development problems and successes, and was objective in identifying the main differences between some Specialist Libraries, although as indicated earlier the level of evidence on which the framework was based was not high. The first evaluation of the Libraries highlighted the problems in moving from the engaged stage to the active stage (Yeoman, Urquhart, & Sharp, 2003). This second evaluation also found this to be a problem, suggesting that moving between some stages may be more difficult for some types of communities than others. Unfortunately, there are few independent longitudinal evaluations of genuine communities of practice to assess whether the stage framework needs expansion, or whether the problem is really one of describing appropriate phases for system states in complex systems, and identifying triggers for change.

The problems surrounding the RMS implementation indicated some of the problems of becoming an IT-led rather than an IT supported venture, and that IT-led communities can fail to thrive (Kling & Courtright, 2003). IT should support existing social networks, but there may be problems ahead for the Specialist Libraries in fostering multidisciplinary working (Dopson et al., 2002; Ferlie et al., 2005; Greenhalgh et al., 2004). Perhaps multidisciplinary, virtual health communities of practice will flourish better when there is a real identified clinical need for sharing and creation of new knowledge, such as in pain management for children (Curran-Smith, Abidi, & Forgeron, 2005). Evidence from the Services' Collaboratives set up by the NHS to support knowledge management showed a failure to foster the knowledge sharing and creation that might be typical of a community of practice (Bate & Robert, 2002). Such sharing is hard to

achieve unless participants trust each other enough to ask questions and share knowledge (Falkman et al., 2008; Giordano, 2007). The community of practice ideas stress the importance of “legitimate peripheral participation”, and the importance of welcoming newcomers was acknowledged by the Specialist Libraries. An informal email network on evidence based healthcare (CHAIN) provided filtered access to people with know-how and was very popular, but those who were acting at the periphery also appreciated what they could learn from reading the postings (Russell et al., 2004). There sometimes seems to be an assumption among online community developers that “lurking” is a problem and indicative of lack of interest. The advantage of using a community of practice framework is that such lurking is legitimate, not a problem, but participants need to be able to move to more active roles if they wish (Mallinson et al., 2007) and more social network analysis might illuminate the patterns of social interactions to be expected (Curran-Smith & Abidi, 2007).

More importantly, the ideas behind social learning and communities of practice may need to be reviewed before devising IT-supported frameworks to support such learning (Li et al., 2007; Cox, 2005). Eraut (2000) distinguishes three types of learning within social learning and three types of tacit knowledge: tacit understanding of people and situations, routine actions, and the rules for intuitive decision-making. One framework that has been tried in the health sector is the Healthcare Scenario Composer (Cheah & Abidi, 2001). This would provide an electronic forum to allow healthcare experts to respond to a given scenario (which may be “already solved”), a challenge scenario (atypical, which elicits tacit knowledge), or solved-challenge scenario (to assess degree of consensus or disagreement) with a proposed solution. This approach seems to have some similarities with some of the principles of case-based reasoning (Becerra-Fernandez, Gonzalez, & Sabherwal, 2004, p. 160). Falkman et al. (2008) have also designed a community for clinical case discussions. This may be successful in

secondary care, but ethnographic research on knowledge management in primary care points to the very fluid nature of tacit knowledge in primary care, the collectively constructed “mindlines” (the internalised tacit guidelines which were negotiated with a variety of people) according to organisational and time constraints (Gabbay & le May, 2004). To complicate matters further, several groups in the health sector have used the term “communities of practice” as an aspirational term rather than descriptive of actual practice (as noted by Gabbay et al., 2003).

The community of information specialists appeared to working effectively as a community of practice within the general Specialist Library service structure. Within each Specialist Library the management structure generally worked with the reference advisory group contributing advice and guidance that should help satisfy the needs of a professional and lay audience.

The evaluation is limited in that only around half of the Specialist Libraries provided interview data. It is possible that some of those not interviewed had examples of good practice that were not identified. However, the community of information specialists was operating well, and it is likely that news about developments in other Libraries would be well known and brought to the attention of the evaluators.

Conclusions

The evaluation indicated that the Specialist Libraries were operating as communities of practice although not at a very advanced stage.

Librarians developing virtual communities of practice should pay close attention to the design of learning activities that might be expected of the engaged stage of development and the type of collaborative work typical of the active stage of development. Librarians need to do much more than collection management for communities of practice to develop successfully – the information

professional has to interact with users far more intensively. The emphasis should be on encouraging contributions from community members and engaging them in activities relevant to their practice.

The NLH acted on many of the recommendations of the evaluation. For example, Specialist Collections now have access to the content management system for their own home page (a move supported by the updated literature review on the importance of contingent approaches to design). In future more personalisation might be expected from members of a community of practice accustomed to downloading applications (apps) for their own electronic devices.

Structuring library and information services around community of practice principles appears effective, and within the UK, NHS Scotland is following these principles in design of their knowledge networks (Caldwell, Davies, Stewart, Thain, & Wales, 2008). Such services build on the social learning that happens naturally among professionals (although the updated literature suggests that power relations can be tricky to handle, with different professional groups having different values and approaches to learning and expectations of their responsibilities). Some of the difficulties of power relations may be lessened through design of structures such as the reference advisory groups for the Specialist Libraries, which encouraged input from a wide range of stakeholders.

A community of practice is a win-win scenario for supporting evidence based practice, provided appropriate and relevant solutions for the professional community and their problems are designed. As the updated literature review suggests, we still need to find good criteria to judge the effectiveness of communities of practice, but ongoing systematic reviews may provide that evidence.

Acknowledgements

The authors thank the NLH team and the NHS Information Authority for funding this research. We are very grateful to all those who consented to be interviewed, or who contributed to the research in other ways. We are also very grateful to the reviewers for their constructive comments which have improved the paper.

An earlier version of this paper was presented at the EBLIP5 conference in Stockholm, Sweden, June 29-July 3, 2009, and was awarded best oral presentation.

Declaration of Interests

Christine Urquhart is part of a team working under the auspices of the Cochrane Effective Practice and Organisation of Care Group to systematically review the evidence for the effectiveness of communities of practice on health care delivery and professional performance.

References

- Barwick, M. A., Peters J., & Boydell, K. (2009). Getting to uptake: Do communities of practice support the implementation of evidence-based practice? *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, 18(1), 16-29.
- Bate, S. P., & Robert G. (2002). Knowledge management and communities of practice in the private sector: Lessons for modernizing the National Health Service in England and Wales. *Public Administration*, 80(4), 643-663.
- Becerra-Fernandez, I., González A., & Sabherwal R. (2004). *Knowledge management: Challenges, solutions, and technologies*. Upper Saddle River, NJ: Pearson Education.
- Braithwaite, J., Westbrook, J. I., Ranmuthugala, G., Cunningham, F., Plumb, J., Wiley, J., . . . Debono D.

- (2009). The development, design, testing, refinement, simulation and application of an evaluation framework for communities of practice and social-professional networks. *BMC Health Services Research*, 9, 162. doi:10.1186/1472-6963-9-162
- Caldwell, L., Davies, S., Stewart, F., Thain, A., & Wales, A. (2008). Scottish toolkit for knowledge management. *Health Information & Libraries Journal* 25(2), 125-134.
- Catino, M. (1999). Learning and knowledge in communities of work practice: the case of the pilot plants at Cer-Montell. In M. Easterby-Smith M., L. Araujo, & J. Burgoyne (Eds.), *Organizational learning. 3rd international conference, Lancaster*. Lancaster: University of Lancaster.
- Cheah Y.-N., & Abidi, S. S. R. (2001). The role of information technology in the explication and crystallization of tacit healthcare knowledge. *Health Informatics Journal*, 7(3), 158-167.
- Cox, A. (2005). What are communities of practice? A comparison of four seminal works. *Journal of Information Science*, 31(6), 527-540.
- Curran-Smith, J., & Abidi, S. S. R. (2007). Evaluation of an online discussion forum for emergency practitioners. *Health Informatics Journal* 13(4), 255-266.
- Curran-Smith, J., & Abidi, S. S. R., & Forgeron, P. (2005). Towards a collaborative learning environment for children's pain management: Leveraging an online discussion forum. *Health Informatics Journal*, 11(1), 19-31.
- Dopson, S., Fitzgerald, L., Ferlie, E., Gabbay, J., & Locock, L. (2002). No magic targets! Changing clinical practice to become more evidence-based. *Health Care Management Review*, 27(3), 35-47.
- Dubé, L., Bourhis, A., & Jacob, R. (2005). The impact of structuring characteristics on the launching of virtual communities of practice. *Journal of Organizational Change Management*, 18(2), 145-166.
- Eraut, M. (2000). Non-formal learning and tacit knowledge in professional work. *British Journal of Educational Psychology*, 70(1), 113-116.
- Eysenbach, G., Powell, J., Englesakis, M., Rizo, C., & Stern, A. (2004). Health related virtual communities and electronic support groups: systematic review of the effects of online peer to peer interactions. *British Medical Journal (BMJ)*, 328(7449), 1166-1171.
- Falkman, G., Gustafsson, M., Jontell, M., & Torgersson, O. (2008). SOMWeb: a Semantic Web-based system for supporting collaboration of distributed medical communities of practice. *Journal of Medical Internet Research*, 10(3), e25. doi: 10.2196/jmir.1059
- Ferlie, E., Fitzgerald, L., Wood, M., & Hawkins, C. (2005). The nonspread of innovations: the mediating role of professionals. *Academy of Management Journal*, 48(1), 117-134. Retrieved 26 Feb. 2010 from <http://www.mangematin.org/MCOI/Texes%202006-7/amj2005%20ferlie.pdf>
- Fox, S. (2000). Communities of practice, Foucault and actor-network theory. *Journal of Management Studies*, 37(6), 853-867.
- Fuller, A., Hodkinson, H., Hodkinson, P., & Unwin, L. (2005). Learning as peripheral participation in communities of practice: a reassessment of key concepts in

- workplace learning. *British Educational Research Journal*, 31(1), 49-68.
- Fung-Kee-Fung, M., Goubanova, E., Sequira, K., Abdulla, A., Cook, R., Crossley, C., Stern, H. (2008). Development of communities of practice to facilitate quality improvement initiatives in surgical oncology. *Quality Management in Health Care*, 17(2), 174-185.
- Gabbay, J., le May, A., Jefferson, H., Webb, D., Lovelock, R., Powell, J. & Lathlean, J. (2003). A case study of knowledge management in multi-agency consumer-informed "communities of practice": Implications for evidence-based policy development in health and social services. *Health*, 7(3), 283-310. doi:10.1177/1363459303007003003
- Gabbay, J., & le May, A. (2004). Evidence based guidelines or collectively constructed "mindlines?" Ethnographic study of knowledge management in primary care. *British Medical Journal (BMJ)*, 329(7473), 1013-1017.
- Giordano, R. (2007). An investigation of the use of a wiki to support knowledge exchange in public health. In *Conference on supporting group work: Proceedings of the 2007 international ACM conference on supporting group work, November 04-07, Sanibel Island, Florida*. Retrieved 26 Feb. 2010 from <http://delivery.acm.org/10.1145/1320000/1316664/p269-giordano.pdf?key1=1316664&key2=1995027621&coll=GUIDE&dl=GUIDE&CFID=77838471&CFTOKEN=88621490>
- Gongla, P. & Rizzuto, C. R. (2001). Evolving communities of practice: IBM Global Services experience. *IBM Systems Journal*, 40(4), 842-862.
- Greenfield, D., Travaglia, J., Nugus, P., & Braithwaite, J. (2007). Health sector community of practice: final report. A content analysis and systematic review of the health community of practice research literature. In *University of New South Wales, Faculty of Medicine*. Retrieved 26 Feb. 2010 from [http://www.med.unsw.edu.au/medweb.nsf/resources/2007Articles1/\\$file/Health+Sector+CoP+Literature+Review.pdf](http://www.med.unsw.edu.au/medweb.nsf/resources/2007Articles1/$file/Health+Sector+CoP+Literature+Review.pdf)
- Greenhalgh, T., Robert, G., MacFarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: systematic review and recommendations. *The Milbank Quarterly*, 82(4), 581-629.
- Hildreth, P. M., Kimble, C., & Wright, P. (1998). Computer mediated communication and international communities of practice. In *Computer Mediated Communications and Communities of Practice. Proceedings of Ethicomp'98, March 1998, Erasmus University, The Netherlands*. Retrieved 26 Feb. from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=681184
- Kling, R. & Courtright, C. (2003). Characterizing collective behavior online: The social organization of hangouts, clubs, associations, teams and communities. *The Information Society*, 19(3), 221-235.
- Lau, F., & Hayward, R. (2000). Building a virtual network in a community health research training program. *Journal of the American Medical Informatics Association*, 7(4), 361-377.
- Lave, J., & Wenger, E. (1991). *Situated learning: legitimate peripheral participation*. Cambridge: CUP.
- Lesser, E. L., & Storck, J. (2001). Communities of practice and organizational performance. *IBM Systems Journal*, 40(4), 831-841.

- Li, L. C., Grimshaw, J. M., Nielsen, C., Judd, M., Coyte, P. C., & Graham, I. D. (2007). Use of communities of practice in business and health care sectors. *Implementation Science*, 4, 27. doi:10.1186/1748-5908-4-2
- Mallinson, S., Popay, J., Kowarzik, U., & Mackian, S. (2006). Developing the public health workforce: A "communities of practice" perspective. *Policy & Politics*, 34(2), 265-285.
- Markus, L. M. (2001). Toward a theory of knowledge reuse: Types of knowledge reuse situations and factors in reuse success. *Journal of Management Information Systems*, 18(1), 57-93.
- Moreno, A. (2001). Enhancing knowledge exchange through communities of practice at the Inter-American Development Bank. *Aslib Proceedings*, 53(8), 296-308.
- Nutley, S. M., & Davies, H. T. O. (2001). Developing organizational learning in the NHS. *Medical Education*, 35(1), 35-42.
- O'Dell, C., Hubert, C. & McDermott, R. (2001). *Building and sustaining communities of practice: continuing success in knowledge management*. Houston, TX: American Productivity & Quality Center.
- Russell, J., Greenhalgh, T., Boynton, P. & Rigby, M. (2004). Soft networks for bridging the gap between research and practice: Illuminative evaluation of CHAIN. *British Medical Journal (BMJ)*, 328(7449), 1174-1179.
- Sheffield, J. (2008). Does health care for systemic development? *Systems Research and Behavioral Science*, 25(2), 283-290.
- Tolson, D., Booth, J. & Lowndes, A. (2008). Achieving evidence-based nursing practice: impact of the Caledonian Development Model." *Journal of Nursing Management*, 16(6), 682-691.
- Urquhart, C., Yeoman, A., & Sharp, S. (2002). *NeLH communities of practice evaluation report*. Aberystwyth: University of Wales Aberystwyth. Retrieved 26 Feb. 2010 from <http://users.aber.ac.uk/cju/nelhcop1.6-revisedfinal.doc>
- Wenger, E. (1998). *Communities of practice: Learning, meaning and identity*. Cambridge: CUP.
- White, M. (2001). Communities of practice. *Freepint*, 101. Retrieved 26 Feb. 2010 from <http://www.freepint.com/issues/291101.htm#feature>
- Yeoman, A., Urquhart, C., & Sharp, S. (2003). Moving communities of practice forward: The challenge for the National electronic Library for Health and its Virtual Branch Libraries. *Health Informatics Journal*, 9(4), 241-252.

Appendix 1

Interview schedule

Participants were sent the questions for the interview in advance. The order of questions varied according to the focus of the interview and whether the interviews were being conducted with the clinical lead or the information specialist.

Background and organisation

1. Please tell me a bit about the background to your Specialist Library.
2. How does the Specialist Library team operate and what contact is there with developers of other Specialist Libraries?
3. Are there any particular problems with the development of the Specialist Library (e.g., innovation versus conformity with NeLH norms)?
4. How do you see the link between your Specialist Library and the NeLH?
5. What links do you have to the NKS and/or the Map of Medicine?

Supporting the community of practice/stakeholders

7. Do you have a perception of the Specialist Library as serving an identifiable community of practice?
8. Do you see a role for the Specialist Library in encouraging collaborative working within the community of practice?
9. Are there areas of unmet information need in your specialism, and will the Specialist Library help to address them?
10. Do you see a training or mentoring role for the Specialist Library?
11. How do you ensure that the information available via the Specialist Library is current and appropriate to the members of the community?
12. Are there other organisations within the specialism that provide a similar service to the Specialist Library?

Audit and future development

13. Do you collect usage statistics and, if so, what do you do with them?
14. What evaluation mechanisms are in place?
15. Do you know what will happen when your grant ends – have you made any contingency/future plans?

NB: At the time of the interviews, the Specialist Libraries were still part of the National electronic Library for Health (NeLH). Migration to the National Library of Health occurred in 2006.