Evolution of a virtual Practice Development College for nurses

Peer reviewed research paper

Introduction

Background

In health care the attainment of evidence based practice is at the heart of policy developments. Consequently the current strategy for nursing and midwifery in Scotland challenges the profession to develop models for networking and sharing of evidence based best practice. (1) The Community of Practice” (CoP) framework offers an ideal basis for such networking. By definition a Community of Practice is a social group formed for the explicit purpose of fostering supportive collaborations to nurture and develop practice and individuals. (2)

Developments in computing and communications over the last decade have provided access to completely new ways of communicating that have a potential to increase the communication capabilities of Communities of Practice. Most notable in these technological developments are the emergence of the Internet and the common availability of low cost multimedia PCs. Widespread Internet access has provided a de facto standard for asynchronous communication communities (e-mail) and a standard means of synchronous communication (text-based chat”) and, coupled with multimedia PCs and low cost Web cams, possibilities for audio and video conferencing as possible synchronous communication options.

The Gerontological Nursing Demonstration Project began pioneering ways to support a Community of Practice in 2001. (3) Members of the community (nurses) work within a virtual Practice Development College which acts as a dynamic information repository, a conduit for group communications, an e-learning environment and a gateway to real practice demonstration sites e.g. a Care Home or Hospital Ward. The work of the virtual college centres on the development, testing and implementation of care guidance (best practice statements) and the nurturing of a culture of continuous improvement. (4, 5)

This paper, the first of two, reviews the original virtual Practice Development College from a usability perspective. The current paper deals with historic approaches taken to implementing the virtual college and the valuable lessons learned from experience of its use. Current approaches taken to provide the virtual college environment are discussed elsewhere.

Link nurse profile

Nurses with expertise in working with older people, and whose managers believed could promote change, were recruited to the Community of Practice. Between January and March 2001, the Demonstration Project recruited an initial 30 nurses throughout Scotland on a voluntary basis to form...
An awareness and willingness to commit to the project over three years was required, although it was recognized that such a commitment could not be guaranteed. There was also an expectation that the project would require some time away from the work environment and, because of this, managers were required to indicate in writing their willingness to support both the nurse and the Demonstration Project. The nurses selected were known as “link” nurses because they were expected to act as catalysts for practice development in their local nursing communities and conduits for feedback on emerging best practice statements whose development was the central goal of the CoP. Care was taken to ensure a representative spread throughout Scotland: recruitment of link nurses was Scotland wide and care was taken to ensure a representative geographical spread. The majority of the link nurse population is concentrated within urban environments such as Glasgow and Edinburgh. Rural and remote recruitment however was active to ensure representation from areas such as Shetland and Orkney. This proved quite challenging as the more remote areas are serviced by fewer practitioners. The resulting volunteer group were predominately female, aged between 35 and 55.

Although ICT experience was desirable, ICT competence was not a selection criterion: Upon joining the CoP, the link nurses were surveyed to ascertain their abilities across a range of relevant ICT skill areas including: the operational basics of networked computers and multi-tasking operating systems; use of e-mail and word processing; searching for information on the Web. This survey revealed that whilst a minority of the link nurses had well-developed ICT skills, the overwhelming majority were either newcomers to using computers in general or the Internet in particular (i.e. “newbies”). To quote one of the nurses reflecting on the early days of the project:

“I discovered that I was not alone when I attended induction training on how to use the Virtual College. Many of my colleagues were not even familiar with a QWERTY keyboard and were even more apprehensive about their ability to adapt to such a sophisticated IT tool”.

It was therefore important to provide the link nurses with relevant, structured, ICT related training before they were exposed to the virtual college environment and this training was delivered over several classroom based sessions, early in the project, when the CoP came together. The group participated in intensive training and skills review sessions as part of face to face study days provided in two day blocks three times per year.

The original Virtual College

Contextual and technological drivers

An initial goal of the CoP, and something that still remains a key objective is the development of a series of evidence based “best practice statements”, each addressing some aspect of care of older people (e.g. nutrition, and the construction of a practice model with an explicit value base. (6, 7) This has been achieved through a variety of collaboration strategies both virtual and real. For the virtual college to be able to support best practice development it was essential to provide a software platform that offered effective and diverse forms of electronic communication and information sharing. At the outset, the CoP also faced the challenge of having to deliver this capability in a short period and with little developmental resource. Consequently, rather than pursuing a bespoke solution, attention turned to identifying and evaluating suitable software platforms that were available for little or no cost. As a result of these evaluations (conducted circa. Mid 2001) it was decided to adopt the Collaborative Virtual Workspace (CVW), which is available as open source software (OSS).

Key features of CVW

CVW is a collaborative computing environment that is designed to support temporarily and geographically dispersed work teams. For its user interface, CVW adopts a “virtual building” metaphor where teams can communicate, collaborate, and share information, regardless of their geographic location. Figure 1 depicts the CVW main window.

From a user’s point of view, CVW provides a virtual meeting and work space containing a number of rooms, floors (and even separate buildings) within which applications, information and people are directly accessible. Each room provides context for collaborations within it. Floors and rooms may be named, and room descriptions can be provided to provide additional context for the room. A graphical “map” display of the floor plan is provided to help visualise the collaboration space. Users can navigate through the virtual
building with the graphical map or with a textual command. Additionally, users can navigate by “joining” a specific user who is also online, without knowing their current location in CVW. Figure 2 depicts a plan view of one floor (the Administration Floor) within the Demonstration Project virtual college.

Each room provides a context for communication and document sharing. CVW allowed nurses and college staff to gather in rooms to communicate and share information with one another. Defining rooms as the basis for communication means that users are not required to set up sessions or know user locations; they need only enter a room. Users can also lock rooms and communicate privately within and between rooms.

Rooms are also the basis for document sharing. Users can place documents of different types into a room, allowing anyone else in that room to read the document or view information about the document (such as creator, description, creation date, modified date, last modified by). Persistence is supported because the rooms exist even when no one is in them. Consequently, the document remains in the room for future visitors to see until some authorised user moves or deletes it.

CVW supports a variety of different ways of communicating and sharing information including audio and video conferencing and persistent shared whiteboards (in each room) that enable multiple people to view an image (such as a map) and annotate the image together in real time. Whiteboards maintain attribution of the annotator, so it is possible to see who marked up the whiteboard surface and how. The contents of whiteboards can be printed or exported to a file so that it can be included in another product such as a report. Apart from whiteboards, other document types in CVW include URLs, notes and documents edited through the user’s local applications (e.g., word processor, spreadsheet) that can be imported into CVW where they are managed through CVW’s own document server.

Each user possesses a persistent “briefcase”. The briefcase follows users around the building and can be used to carry documents, exchange documents with other users they meet, and to place and take documents from locations.

One of the most powerful features of CVW is its extensive support for text-based communication (i.e. “chat”). As discussed later, this proved particularly popular with the link nurses. The chat facility provided link nurses with the ability to communicate synchronously and, whilst doing so, to express themselves (“emote”) in a variety of ways similar to those found in verbal communication. For example:

- Engaging in direct communication from one person to another or from one person to a group of people
- Privately communicate with people in the same room or another person in another room
- Expressing in a ‘non-verbal’ manner (e.g., John nods) to all people in a room or privately to another person

All chat-based interactions that occur within a given room in CVW are displayed to the user in a scrollable window. This includes all text communication and activities and events that occur within the room (e.g., notices of when people enter and leave the room, notices of when someone places a document in the room). CVW also provides a room recorder that captures the public text communications that occur within a room. Users have the ability at any time to create a personal transcript of the current recorder session. This proved a valuable feature in archiving dialogue and discussion.

The User experience

Practical achievements

The CoP was recruited for a specific purpose and has successfully produced a range of Best Practice Statements, as well as philosophy and value statements. In terms of tangible output, the Best Practice Statements, philosophy and value statements have been widely reported and disseminated and represent tangible and significant achievements - the intellectual product of the CoP working together to fulfil the aims of the project.

Usability evaluations

Data have also been gathered at strategic points throughout the life of the CoP and analysed to reveal how the community evaluate the strategies and systems employed to foster their collaborative working, knowledge sharing and practice development. The experience of being a member of a CoP has been documented through focus group interviews and questionnaires from the
outset of the project. A summary of the users’ evaluations of CVW is presented below, organised according to the usability dimensions defined by Nielsen. (8)

Learnability and Memorability
Whilst the IT professionals in the project team could appreciate the technical features and elegance of CVW from a software engineering perspective, there was nevertheless concern about the application’s complexity and the potential challenge it would present to the link nurses in terms of learnability and memorability. These concerns were compounded by the nature of the supporting documentation available for CVW: a quick guide to all the functions available and installation and reference guides more suited to system administrators and developers.

To address perceived documentation deficiencies, the team decided to write a separate user guide that would be understood by link nurses and that focussed on tasks (how to) rather than functions (what is). Additionally, the team also organised several classroom based training sessions for link nurses.

Particularly for those new to computers, CVW initially did indeed present familiar interaction metaphors but a complex user interface. From the user evaluations it was clear that a complex user interface could be learned through a strategy of providing appropriate training (problem centred learning), documentation (supplementary task-oriented user guide) and ongoing technical support (the Reception/Help Desk area of the college was “manned” by an IT Professional during office hours).

What follows are typical user testimonies that the system could be learned.

“It took time for me to find my way around the college. However, within a relatively short period I was able to easily access documents, move information from one part of the college to another and leave information from which others would benefit.”

“The format, at first, seemed somewhat bewildering. However, with regular use, and, importantly, dialogue with fellow community members who had either mastered a particular process or were finding problems with others, the general flow of information enabled me to overcome any initial apprehension about how best to use the facility.”

“I think ... there is the fear of you go on (to the computer) and you think maybe I am doing this wrong and you don’t want to appear an idiot so rather than keep persevering you sometimes come off for a while and you just have to persevere it is only through practice that we are going to develop it.”

Errors and Efficiency
At an early stage in the project, prior to going live use with nurses, both the CVW PC client and (Linux) server were subjected to extensive in-house stability and performance analyses. These identified a number of bugs/idiosyncrasies and performance issues, mainly with the PC client (which had been ported from an original UNIX implementation). As a result it was decided that neither audio nor video conferencing be used in a practical way by the link nurses and that little use should be made of whiteboards. The investigation also defined minimum (and recommended) hardware and operating system configurations for both PC clients and the server.

Based on the results of these analyses, it was possible to expose users to a subset of the system functions that were either considered to be stable (low error rate) or possessed known (repeatable) interaction quirks that could be drawn to the attention of users and for which workarounds or alternatives were identified.

The main problem area that subsequently arose concerned the use of the popular chat facility. In the main, the user group had relatively limited keyboard skills and low typing speeds. This lack of proficiency led to typing errors being made, although these were easy to undo. To compensate and minimise their own error rate, users also resorted to typing very slowly which meant that task and transaction efficiency were reduced to the point that, whilst users enjoyed chatting, they were often left rather frustrated either by their own inabilities, or the inability of others, to sustain a productive dialogue.

To the IT professionals in the project team, this phenomenon provided a clear example of an interface that does not satisfactorily support the skill base of the intended users. Subsequent work has shown how speech recognition and speech-to-
text synthesis can be used to address this mismatch.

**Subjective satisfaction**

Despite the difficulties mentioned above, overall, the experience of those link nurses who were able to access CVW was generally positive and is perhaps best summed up by the following quote from a user:

“I … found it an invaluable tool, allowing me to share information and best practice with colleagues, no matter where they are located within the UK, and to feel part of a community of like-minded professionals striving for a common goal - to enhance evidence-based practice in the care of older people.”

The link nurses who were able to access CVW also reported other positive experiences from membership in terms of developing more generally positive attitudes towards the use of computers.

However, as discussed later (see the next section, The Developer experience, under Deploying the system), a significant minority of link nurses were not able to access CVW in their workplace within an acceptable project time scale and this group was left with a distinctly different perception of the worth of the system in supporting them as CoP members.

**The developer experience**

**System stability and performance**

The quality and reliability of open source software (OSS) applications such as CVW are topical issues. Many argue that the emergence of the OSS movement can be seen as a response to poor quality proprietary software. In contrast, the success of OSS has been largely attributed to the speed of development, reliability, portability and scalability of the resulting software: in essence, OSS seems to promote an environment where developers are more likely to do their best work rather than anonymously finish code so that it can be shipped as part of some corporate package (9)

However, it is unwise to make generalisations about the quality, reliability, and performance of OSS. The project team chose not to do so, particularly since the crucial PC user client had been ported from another operating system, and because the server consisted of several, complex interacting components. As mentioned earlier, both the CVW PC client and (Linux) server were therefore subjected to in-house stability and performance analyses that revealed a number of potential problems with the PC client. In contrast, the server components (LambdaMOO and Tomcat servers, and MySQL database), all proved both extremely reliable and scalable (supporting several hundred simultaneous simulated users). The main identifiable concern with the server concerned the security of the underlying operating system (Linux) and its consequent vulnerability to attack.

**System extensibility**

The potential for extensibility that OSS promotes also bore fruit. As noted earlier, separate work has shown how it is relatively straightforward to modify the PC client interface (which is written in Java) so that speech recognition and speech-to-text synthesis can be added to address users’ deficit of keyboard skills. (10)

**Deploying the system**

The most significant problem CVW presented was something that was not fully appreciated by the IT professionals in the project team when the software was originally selected at the outset of the project: namely, the difficulty of deploying the PC client application into the users’ workplace (mainly NHS trusts) and the complexities involved in allowing these client to interact with the CVW server (located at a university).

Two main problems with CVW arose as the project developed. The first, and most fundamental, was that because the application used non-standard ports to pass data across the Internet between the server and clients and these ports were (by default) blocked by NHSNet. The process of having the ports opened was (for very good reason) subject to a fair amount of red tape in the form of several tiers of regional and national NHS bureaucracy and external service providers. This took time and, once approval was obtained, further time was required for the team to run tests at reference sites to confirm that the ports had been unblocked. In all, in the eyes of the users eager to make use of new skills they had learned, the process proved excessively prolonged and, for those users who could only access the system via NHSNet, a source of some considerable frustration. To quote one link nurse:
“Well we talked a bit around … us in (the) group … not able to communicate on the virtual college so there is a feeling of frustration and the word burn out was used because you know when you go on you are not able to get in so there is an element of frustration with that whether if the project was being started again whether the university should have looked at it more how the IT was going to work in the first place because that has frustrated a lot of us.”

To further complicate matters, some NHS trusts operated their own local firewalls and applied additional network security policies and measures. This meant that, despite the port openings, either the system would not work at all, or that the system behaved ways that appeared odd and frustrating to users: most typically documents could not be uploaded or downloaded.

Finally, in some situations problems arose with the desktop installation itself, either due to conflicts with existing applications or desktops security policies.

Disentangling (usually from a distance) the cause(s) of a particular user’s problems was often quite difficult – and again took time. In the end, most (but not all) access problems were resolved:

“IT at work have really been working hard on it but just haven’t managed it and every week I am on the phone and they are on the phone to me. And I just get so frustrated a lot of the time and I just thought you know are we ever going to be able to get it on at work.”

Conclusions

The initial phase of the Gerontological Nursing Demonstration Project described here has shown that with appropriate training, support and documentation, it is possible for nurses with less well developed ICT skills to learn to make productive use of sophisticated software applications but that user interfaces for such tools need to be well-matched to the ICT skill base of the user community.

The initial phase of the Demonstration Project also highlighted the sorts of access issues and problems that may be encountered when attempting to roll out and support bespoke collaboration tools that need to interact with systems outside NHSNet and work within the operational parameters set by individual NHS trusts.

Contemporaneously with the initial phase of the project, one particular trend in desktop computing stands out: the growth in the capability of the Web. For example, the functionality of the Web has expanded to the point that browsers are now increasingly used both as the front-end to other Internet services (e.g. chat, FTP, e-mail) and as the interface to bespoke applications which are delivered using the Web. Indeed, Lewis recently argued that the very idea of developing for a desktop platform is dead and that the Web has become the platform (11). Lewis primarily attributes this to the “Microsoft monopoly” and indeed Microsoft have been very active in applying this principle to their own products and technologies (e.g. adding instant messaging); even “standard” desktop applications such as the Microsoft Office suite have been extended to embrace Web technologies: for example, to support document sharing and discussion.

Experience with the initial phase of the project and recognition of these emerging trends obliged the project team to reflect on whether communication and collaboration systems should use “non standard” (e.g. OSS) client-side applications or alternatively be based, as far as possible, on ubiquitous applications and technologies that, de facto, are emerging as part of the standard PC “office” desktop environment. For the second (current) phase of the project, the team elected to adopt a solution that uses a browser based interface. Experience with using this system is discussed elsewhere.

References

Current floor you are on. You can also go to different floors on the building from this menu.

Different locations on the floor.

Your position on the present floor is highlighted.

Two types of view for the map. Currently in Over Head View.

Figure 2 Structure of the Administration Floor within the Demonstration Project virtual college

Figure 3 depicts key elements and options supporting text communication.