Journal of Universal Computer Science, vol. 10, no. 3 (2004), 284-293
submitted: 30/1/04, accepted: 27/2/04, appeared: 28/3/04 © J.UCS

Communities of Practice: An Integrated Technology Perspective[1]

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Abstract: It has been observed that for a Community of Practice (CoP) to be successful, a significant amount of time shall be devoted to understanding the needs of community members. Furthermore, a tool to support the CoP shall be selected based on the kind of activities that are most important for that CoP. Since many of the tools available today place emphasis on a single type of application such as e-learning or document management, unplanned selection may rise unwanted barriers. In this paper, we examine the benefits of integrating some of the following types of technologies into one single technological platform and their impact on CoP: (1) content- and document Management, (2) collaboration / groupware, (3) web conferencing, and (4) e-learning.

Key Words: Communities of Practice, Knowledge Management, e-Learning, Information Technology, Intranet, Extranet, Personalization, Enterprise Content Management.
Categories: A.1, C.2.4, H.4, H.5, K.6

1 Introduction

Wenger defines Communities of Practice (CoP) by stating that *"members of a community are informally bound by what they do together from engaging in lunchtime discussions to solving difficult problems and by what they have learned through their mutual engagement in these activities"* [Wenger, 1998]. CoP develop their shared practice by interacting around problems, solutions, and insights, and building a common store of knowledge [Wenger, 2001]. CoP are different from teams, because they do not necessarily have a clear focus or a clear deliverable, and because they are not limited in time to a single project [Carotenuto, Etienne, Fontaine et al, 1999].

In the mid 1980'ies there were early online communities for education [Preece et al 2003]. According to one recent survey, almost half of those organizations having knowledge management initiatives underway have at least initiated CoP *within* the organization [Kok, 2003]. However, CoP have had a moderate track record in the private sector, although some successful examples exist (such as IBM and Shell) [Smits et al, 2004]. In contrast, the public-sector "culture" is considered to be more conducive to CoPs [Santenello et al, 2003]. For example, [Fennessy, 2002] has studied Knowledge Management and CoP within the context of evidence based health

[1] A short version of this article was presented at the I-KNOW '03 (Graz, Austria, July 2-4, 2003).

care within a large teaching hospital in Melbourne, Australia. [Milakovich, 2002] proposes a model to employ the internet to increase citizen participation in government. Furthermore, Kok anticipates a shift towards customer facing communities to facilitate knowledge sharing with suppliers and partners.

Technology support for CoP has progressed over time: [Preece et al 2003] point out that the earliest technologies were e-Mail (developed in 1972) and list servers (invented around 1975). In the late 80ies, chat systems and instant messaging were introduced. In the early 1990´ies, the World-Wide Web facilitated the widespread use of web sites and the development of online community groups. After that, graphical representations started to appear. Recently, voice over IP as well as web conferencing has started to become more widespread.

In reality a Virtual Community typically builds on what members of community commonly have (e.g., e-mail, Internet chat rooms, list servers) [Caldwell, 2001]. Within the organization, intranet communities may use collaborative network and groupware infrastructure similar to virtual teams. [Wenger, 2001] points out that tools exist to support CoP approaches from many angels, but no technology is available to fully support CoP. In this paper, we will aim to bridge the gap between different types of technology.

2 Community-oriented Technologies

There are numerous technologies to support CoP including knowledge bases, knowledge worker's desktop, project spaces, website communities, discussion groups, synchronous interactions, e-Learning spaces, access to expertise [Wenger, 2001]. These can be summarized as (1) content- and document management, (2) collaboration / groupware, (3) web conferencing, and (4) e-learning. Naturally, each type of technology has their strengths and weaknesses: in many communities, text chat is currently the preferred means of real-time live service. While text only communications is good for basic communications, it is not a replacement for graphics or images for many purposes [Tyndale, 2002]. To deploy Voice over Internet Protocol (VoIP) their computer must be equipped with an Internet phone that accepts VoIP calls. Existing technology makes it possible to achieve a live link via VoIP, but there remain several practical obstacles to widespread use. Security and privacy remain concerns. In addition, bandwidth for VoIP has to be sufficient.

2.1 Content- and Document Management

From a technical perspective, content- and document management technologies include document handling throughout the content lifecycle, such as imaging and workflow, storage, as well as records management, enterprise report management/computer output to laserdisc, and web content management [Angerhausen et al, 2003]. Examples for products with content- and document management functionalities are Documentum, Hummingbird, and Hyperwave.

Some of the benefits to the CoP are [Wenger, 2001] to associate documents from the corporate knowledge base with the CoP and vice versa, associate document folders with a community, or to have multiple hierarchical file structures (i.e. in one

taxonomy that helps community members think about their practice, in another perspective to include a project's view, etc).

2.2 Collaboration / Groupware

Collaboration support has evolved from internally focused groupware systems to web-based products targeting flexible and distributed teams [Hayward et al, 2002].

The core functionality of team collaboration support products is the ability for a team to share documents and conduct discussions around those documents. Collaboration tools also help capturing and preserving knowledge, managing collaborative processes, managing projects and resolving issues. They support cross-functional or geographically dispersed project teams [Wilson, 2002]. Examples for vendors of collaboration tools are eRoom / Documentum, Intraspect, and Hyperwave.

[Shelhamer, 2002] distinguishes between five collaboration models: library, solicitation, team, community, and process Support. Collaboration tools enable community members with various ways of seeing what is going on and who is involved in what [Wenger, 2001]. For example, they provide a list of who is on: presence awareness is usually associated with a capability for instant messaging so you can interact with people you see present. Most project spaces have facilities for multiple people to work on one document, by checking it out to avoid version conflicts.

2.3 Web Conferencing

Since the mid 1990`ies it is possible to conduct telephone calls over the internet [Adams et al, 2003]. Today, web conferencing tools often use a combination of media, including audio and video, to provide an experience of co-presence. Some use physical analogies, such as auditorium, conference center, or building [Wenger, 2001].

There are various applications of web conferencing: (1) to (partially) replace traditional telephone lines to achieve cost savings, (2) to supplement telephone calls and –conferences with media material such as presentations or pictures, (3) to conduct meetings and presentations "virtually" to limit the need for travel, (4) in technical customer support call centers to support clients or staff on site, or offer services out of call centers, and (5) as part of e-learning.

Typical applications of web conferencing for the CoP are virtual auditorium (one-to-many), moderated meetings, informal meetings (few-to-few), synchronous conversation (any-to-any chat servers), and chat-oriented virtual community space (many-to-many) [Wenger, 2001]. Examples of vendors offering web conferencing tools are WebEx, Lotus, and Hyperwave.

2.4 e-Learning

In technical terms, an e-Learning system typically consists of the following components: registration capabilities, management of curriculum and courses, skills and records management, student interfaces to courseware, administration, and external system application programming interfaces [Lundy, 2003].

[Kriaucioniene et al, 2002] point out that e-learning communities are a powerful tool for knowledge integration and exchange between the actors with separate knowledge bases. Many e-learning tools provide courseware thereby contributing to conscious learning (i.e. the learner is aware of the fact that he or she is learning). Then, there are various ways of more unconscious learning (i.e. such as browsing the web, searching a knowledge base, or communicating with peers). Some tools such as Hyperwave support both conscious and unconscious learning, for example by tying learning resources to work processes, or letting learners help learning content progresses over time through annotations. Other vendors of e-Learning products are Docent, and Saba.

3 An Integrated Technology Perspective

There is one type of community-oriented technology which is exceptional in the sense that it is an integration technology by itself: enterprise portals. They offer the promise of a single, personalized gateway to an enterprise's application software, databases, and unstructured information from disparate sources. Most portal products are able to connect employees, customers, business partners, and others in a browser environment [Bullinger et al, 2002]. From a CoP perspective, enterprise portals provide an enterprise level window to list all communities [Wenger, 2001]. Furthermore, they allow to adapt the presentation to individual needs, to facilitate access for an outside person to the CoP and its knowledge base. For example, non-members would be recognized as such and provided with extraneous information (like summaries) when browsing through the knowledge base. Vendors offering portal tools include Plumtree, SAP, and Hyperwave.

One question that arises is whether CoP require extraneous technology. In fact, [Caldwell, 2001] has observed that communities often build on the technology they already have. This holds particularly true for internet communities and CoP in academia. As pointed out above, within organizations there are co-existent types of collaboration such as team, community and process [Shelhamer, 2002] which may have overlapping but different requirements. For tools to support the most important activities of the CoP [Wenger, 2001] the needs of community members shall be studied carefully [Cothrel et al, 1999]. From an organizational perspective, overlaps between otherwise autonomous tools lead to an unwanted cost and administration overhead. Thus, the term of Smart Enterprise Suite has been coined which offer a set of integrated tools which are believed to substantially reduce integration costs [Shegda et al, 2002]. However, many of the community-oriented tools available today highlight specific kinds of applications such as e-learning or document management. In this chapter we will discuss the benefits of combining applications into one "umbrella" type of tool.

3.1 Content- and Document Management

From a CoP perspective, what are the benefits of adding content- and document management capabilities to collaboration / groupware, web conferencing, e-learning, and portal, respectively?

Deploying content- and document management combined with collaboration tools links knowledge creation and capture, is particularly suitable for communities with a high amount of collaboration around documents. Knowledge desktops integrate knowledge and work to make participation in communities seamless. Some collaboration tools (such as team collaboration) offer limited degree of document management. One example is Microsoft SharePoint which is aimed at smaller groups where security is not an issue.

Combining web conferencing tools with content- and document management facilitates the expansion of the knowledge base by storing and finding conferencing sessions. Furthermore, content can more easily be (re-)used as background material for conferencing sessions.

Lotus and Hyperwave are some of the surprisingly few vendors who have combined e-Learning with content- and document management technology. This type of integration reduces the cost of learning material "creation", turns learning material into evolving objects and bridges the barrier between conscious and unconscious learning.

3.2 Collaboration / Groupware

Collaboration and conferencing are two closely related types of technologies: web conferencing is also referred to as synchronous communication (because there is no delay in communication between community members). In contrast, collaboration tools are often said to provide asynchronous communications (e.g. e-mails remain in a "mailbox" until they will be read). Some vendors such as Open Text and Hyperwave offer both types of technology. Although there is some overlap (also in the objectives for deploying these technologies for CoP) web conferencing is becoming popular only now such that we can expect to see enhanced products in the near future.

When it comes to integrating collaboration with e-learning we need to distinguish between special purpose learning spaces and fully fledged workspace tools: for example, many of the e-learning vendors offer discussion forums to enable dialog between learners. On the other hand, there are tools to support collaboration in work teams where all work resources (including documents and staff) can be identified through that work space. When integrated with e-learning such a collaboration tool connects instruction-based learning and working-based learning with each other.

3.3 Web Conferencing and e-Learning

Some e-learning vendors offer web conferencing as part of their virtual classroom product. However, the emphasis is more on conference / presentation rather than meeting / discussion.

Modern e-learning systems not only allow the delivery of static web-content: the integration with Knowledge Management provides the learner with access to the corporate knowledge base, peers, experts, etc. Integrated Knowledge Management technology is well suited for a "modern" approach to learning [Yager, 1991]: In simple terms, learning is steered by the learner who will on demand pull knowledge from peers and codified knowledge in a database. Both the corporate knowledge base as well as the CoP are invaluable sources for learning. Since integrated Knowledge Management suites are capable of providing a unified knowledge base, members of

the CoP as well as other employees have the ability to gain access to those skills which they need for their everyday work, either through documented knowledge in the database or through experts around the company.

Table 1 summarizes the findings of chapters 3.1 – 3.3.

Benefits of adding Content- and Document Management to …	
Collaboration / Groupware	• Tightens the link between the processes of creating and sharing knowledge (through interaction and negotiation in the context of conversations) and the creation of a repository with documents to capture this [Wenger, 2001] • Enhanced suitability for communities where collaboration involves a degree of documents such as in engineering or in research & development • Reduces need to purchase (or even build) overlapping functionality such as document storage and access rights management in two separate tools
Web Conferencing	• Ability to retain conferencing sessions and expand knowledge base • Have background material available for conferencing sessions
Benefits of adding Collaboration / Groupware to …	
Web Conferencing	• Possibility to choose the appropriate means of communication depending on the situation: web conferencing for issues that need to be resolved in a short period in time, more complex types of communication involving e.g. gesture; asynchronous communications for simple queries, enquiries to people who are "currently" unavailable, etc. • Reduces need to build / purchase overlapping functionality in two separate tools.
e-Learning	• Connects instruction-based learning and working-based learning with each other [Wenger, 2001] • Reduces need to build / purchase overlapping functionality such as discussion forums or bulletin boards in two separate tools
Benefits of adding e-Learning to …	
Content- and Document Management	• Reduce cost of learning material creation by re-purposing selected documents as learning content • Through annotations - turn static e-learning course into a knowledge object evolving over time [Droschl et al, 2002] • Break up the barrier between conscious learning and unconscious learning [Farmer et al, 2004].
Web Conferencing	• Facilitate synchronous communications among peers • Enhance learning content with multi media matrial (comments by peers)

Table 1: Benefits of combining Content- and Document Management, Collaboration / Groupware, Web Conferencing, and e-Learning.

4 Discussion

A key issue when introducing CoP is integrating it with the corporate perspective. As pointed out above, there are various other forms of collaboration that may co-exist such as dispersed project teams, process, and CoP [Droschl, 2003]. In the following, two popular knowledge management strategies shall be considered: (1) codification (i.e. writing documents to express people's knowledge and experience and distributing that information to those who need it), and (2) personalization (i.e. channeling individual expertise by linking people with people) [Hansen et al, 1999].

Ad (1) Codification: The building parts of codified knowledge include office documents, e-mail, meeting protocols, project documentation, as well as archived video and voice conferences, contributions to discussion forum, instant messaging, and chat. These are "produced" throughout the organization, in various projects, processes, knowledge networks and CoP. From an organizational perspective, creating this information is desirable. However, to the individual codification and documentation may appear as a burden. Technology can help here by facilitating the re-use of messages in discussion boards and the like.

Re-use of codified knowledge (i.e. information) is often at other places than those where the information was produced. To facilitate distribution, communities may be combined with the organizational perspective by providing so-called multiple views on documents according to changing context: when browsing the CoP context (or virtual CoP space [Carotenuto, Etienne, Fontaine et al, 1999]) members would see all documents and information related to the CoP. When browsing the organizational unit context, staff in that business unit would have access to those documents relevant to the business unit. Since some documents may occur in multiple contexts, there are multiple views on these documents.

The merits of a codification strategy include the following: (1) documents are valuable source for identifying subject matter experts. (2) When trying to keep training content up-to-date and appropriate for the targeted group, regular documents may easily be integrated into a online courses. According to a personalization strategy training content is presented in a way which is appropriate for each individual. For example, a project management course may contain an optional part on software development aimed at one group, and another optional part regarding industrial plant construction for another group of people. In any case, knowledge networks as well as the technology associated with it, will facilitate the interaction of learners in their peer group.

Ad (2) Personalization: A key benefit of the tools described above is in connecting people via long distances. For members of a distributed community, standard web browsers are sufficient to gain access to community technology. Making discussions widely available through a central knowledge base facilitates access to the CoP for non-members, simply because conversation from the community can be browsed at anytime and in principle by anyone. Personalization may facilitate access to the CoP for non-members. For example, while members might see individual contributions to discussion in the CoP, non-members (which could be all of those who have made not made contributions before) will instead see summaries of collections.

Wherever desirable, access rights management allows to block information for specific audiences (such as different organizations or competing business units).

Table 2 gives an overview of vendors offering community-oriented tools. Most vendors focus on specific aspects, while Hyperwave is the only vendor offering an integrated community-oriented product to provide clients with the benefits discussed above.

Type of Technology	Vendors offering Community-oriented Technologies		
Content- and Document Management	Documentum	Hummingbird	Hyperwave
Collaboration / Groupware	eRoom / Documentum	Intraspect	Hyperwave
Web Conferencing	WebEx	Lotus	Hyperwave
e-Learning	Docent	Saba	Hyperwave
Enterprise Portal	Plumtree	SAP	Hyperwave

Table 2: Vendors offering Community-oriented Technologies

5 Summary

When communities involve more than just a few members, and become dispersed, or there is much information to be exchanged, technology becomes inevitable. We have found that in many cases community-oriented tools place emphasis on a single type of technology. In some cases, there are overlaps, such as between e-learning and web conferencing. An overall perspective for community support is still the exception.

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