

How IT can help Build and Sustain an Organisation's Communities of Practice: *Spanning the Socio-Technical Divide*

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Abstract

Communities of Practice (CoPs) are seen as a primary vehicle for knowledge sharing across large and disparate organisations. It is therefore expected that technology will play a critical role in enabling global CoPs. The usefulness of information technologies (IT) to support CoP activity in two large, but quite different, global organisations is analysed and common themes developed. BHP Billiton is one of the world's largest diversified resources company, with a strong industrial heritage and a mix of blue and white collar workers and levels of IT literacy. CSC is one the world's leading IT service providers, with a highly IT literate staff and a relatively sophisticated IT support environment. Both organisations could be considered early adopters of the CoP concept. This paper tracks their evolution and the lessons learned along the way.

The common themes arising from comparing and contrasting these two experiences mostly reflect the socio-technical challenges faced, when IT enabling CoPs. In both organisations the adoption of the newer collaborative tools is slower than anticipated, with the tried and tested face-to-face, teleconferencing and e-mail alive and well. The rule of people first, technology second is reinforced in both organisations. Technology adoption was far more successful as a response to CoP demand than a technology push. Where technologies are deployed, the level and degree of support was critical. The commitment of CoPs to a particular tool is fragile and easily lost through inconsistent performance of the technology. As well as facilitating CoPs, IT also plays an important role in developing measures and metrics for supporting CoPs as a value adding business resource. The ability to digitally track CoP activity provides an additional value add role for IT.

While the usefulness of IT to support CoPs has largely been oversold in the past, BHP Billiton and CSC are two organisations that have persevered and learnt from their respective experiences, to the extent that IT is now playing a key role in sustaining healthy and valuable CoP programmes.

Introduction

Communities of Practice (CoPs), as effective vehicles for knowledge sharing, are fast becoming the cornerstone of Knowledge Management programmes around the world. (Wenger and Snyder, 2000). The majority of CoP “early adopters” are global organisations looking to leverage their knowledge across widely distributed organisations. With geographical separation comes the need to use technology to sustain contacts within the communities, in many cases, a “necessary evil”. The human sensitivities associated with CoPs are often not well respected by the current class of collaborative IT systems. What works and what does not, will often be a case of trial and error. While the heavy use of IT is not a necessary pre-condition for successful CoPs, there is sufficient evidence now that those organisations with successful CoP programmes will make better use of technology than those that do not. Leading organisations like Buckman Laboratories, BP, the World Bank, IBM, Schlumberger and Xerox all make effective use of IT systems to support their CoPs. (Collison and Purcell, 2001; Edmundson, 2001, Lesser & Storck 2001; Fulmer, 2000; Pan, S.L.,1998)

This paper describes the experiences of two “CoP early adopter” companies in BHP Billiton (BHPB) and Computer Sciences Corporation (CSC). In this paper CoPs are defined as informally established groups, driven to collaborate by a common purpose or discipline. Global CoPs (also referred to as “Networks in this paper) are often formally sponsored by senior management, however, most CoPs are informally formed as “bottom up” initiatives.

BHPB is the world’s largest natural resources company with operations in over 100 sites world-wide, including many remote area sites. CSC is one of the world’s largest IT companies with over 65,000 staff operating at 400+ sites. BHPB is very much an industrial company with a large mix of blue-collar and white-collar workers with varying levels of computer access and literacy. CSC on the other hand has a staff profile with extremely high levels of computer access and literacy.

Both companies have global reach and a strong need to leverage their knowledge across their respective organizations. Networks and CoPs are seen as ideal vehicles for achieving this goal, without the need to over complicate the formal organisational structures. The global nature of some of the CoPs is problematic in itself. The inability to have regular face to face contact presents some serious challenges to sustaining effective global CoPs.

Both BHPB and CSC have addressed these challenges over the past decade or so. The following case studies will trace the evolution of CoPs and the use of technology to support them over this time. The experiences of both companies will be compared and contrasted before some common themes and lessons are drawn from experiences to date. The lessons learned should be broadly applicable to organisations across all industry sectors.

The BHP Billiton Story

BHPB was formed as a result of a merger of BHP and Billiton in 2001. BHP was formerly Australia’s largest corporation with global interests in mining, petroleum

and steel. Billiton was a large South African based mining house, with operations spanning all continents. This story reflects the BHP experiences leading up to, and including the merger with Billiton and subsequent de-merger of BHP Steel. While it could be argued that BHP had been practicing knowledge management for decades, it was the BHP services division (IT, Engineering and Transport) that initially introduced knowledge management into BHP in the mid 1990s. The programme became organization wide in 1999, with the establishment of a corporate Knowledge Management programme and the appointment of a Chief Knowledge Officer. In recent years BHPB has followed the path of similar early adopters like BP and Xerox in embedding knowledge management into day-to-day business operations (Collison and Parcell, 2001). The Corporate Knowledge Management programme has now been integrated into its overall business improvement / operating excellence function.

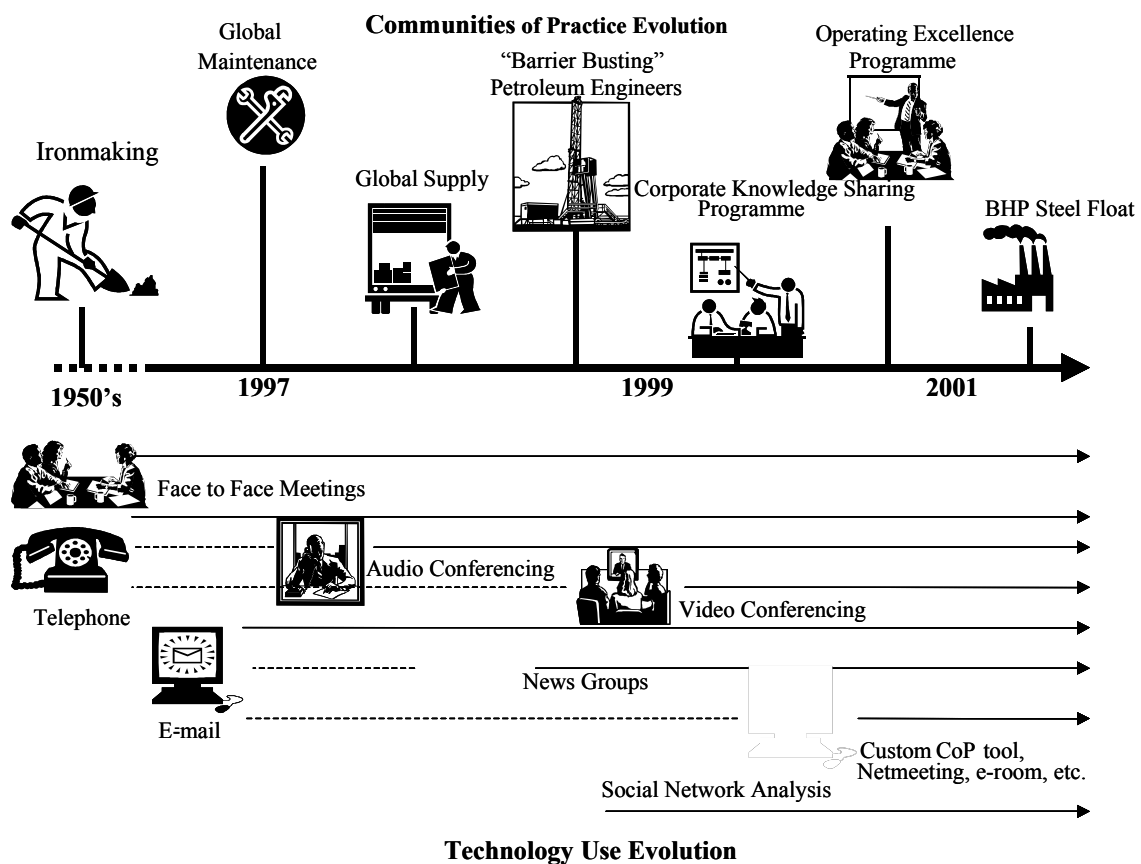


Figure 1 – CoP Evolution and Technology Adoption at BHP

BHP Community Evolution

The earliest identifiable Community of Practice within BHP was the Steel Ironmaking Practices Network. This network can trace its origins to before the Second World War. The ultimate success of the Ironmaking community led to its replication within other disciplines, initially within the Steel divisions and then throughout the other divisions of Minerals, Petroleum and Corporate functions. Figure 1 identifies some of the key CoPs that have evolved from the CoP model established by the Ironmakers.

While the Ironmakers were all Australian based, the first truly global communities were established for Maintenance Engineering and Supply. These global networks were formed through the amalgamation of previous divisional communities and spanned the continents of the Americas, Europe, Africa, Asia and Australia. Within the Petroleum division the global Petroleum Engineering Network undertook an innovative “Barrier Busters” programme whereby any “barriers to knowledge sharing” were identified and systematically addressed (Balnaves and Busch, 2002). The Petroleum Engineering Network has now delivered multiple \$millions of value to BHPB’s bottom line. In early 2000 a corporate Knowledge Sharing programme was established with a major focus on facilitating effective CoPs. With the BHPB merger in 2001 the key responsibility for knowledge sharing moved to the global Operating Excellence (OE) programme. The OE programme has specific responsibility in facilitating identified global networks in areas like Maintenance, Mine Planning, Mining Operations, Processing and Supply.

In 2002 BHPB divested its Steel businesses, and along with it a majority of CoPs. Prior to the Steel divestment there were over 200 identifiable CoPs within BHPB. Since the divestment BHP Steel has managed to sustain and grow its CoPs within its now, independent business. At the same time BHPB has continued to successfully grow and sustain its CoPs under the guidance of its Operating Excellence programme. CoPs are now well established vehicles for knowledge sharing across both organizations, with many examples of tangible benefits arising from their respective activities.

Technology Use Evolution

Figure 1 also loosely tracks the technology adoption cycle in support of the building and sustaining of CoPs. What is quickly apparent is the adoption process for new technologies is slower than one would anticipate, with the older technologies e.g. telephone, audio conferencing, not being superseded by newer collaborative tools. The other key feature is there is no single best tool. Across the whole portfolio of CoPs there are good examples of use for all the identified support technologies.

A survey conducted in 2001 asked community members what technologies they thought best supported them in sustaining community activity (using a preference rating of 5 = best and 1 = worst). From nearly 500 respondents, the strong preference for face-to-face contact is not surprising. The use of e-mail and the telephone still dominated over the newer technologies, though the use of the newer collaborative tools is now slowly improving.

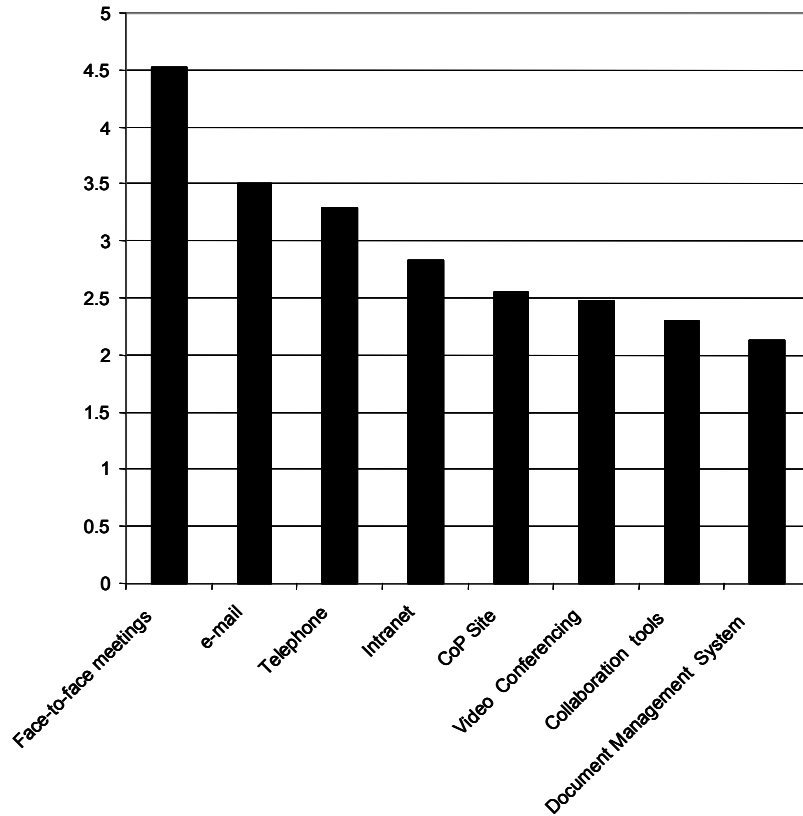


Figure 2 – Preferred technologies for supporting CoPs

The BHP Billiton CoP Support Tool

In 2000 the Corporate Knowledge Programme sponsored the development of a custom CoP support tool. The intent was to provide a facility that could be freely available to the 20,000+ intranet users, to form and run their own CoPs. A key principle adopted was that there be no barriers to knowledge sharing for staff, at any level. Allowing staff to establish and run their own CoPs was a clear reflection of this principle in action. The tool provides the basic functions of electronic discussions, document sharing, news broadcasting, requests for help and a directory of members. Additionally, statistics are collected to assist the Knowledge Sharing programme to monitor and improve on the CoP programme as a whole.

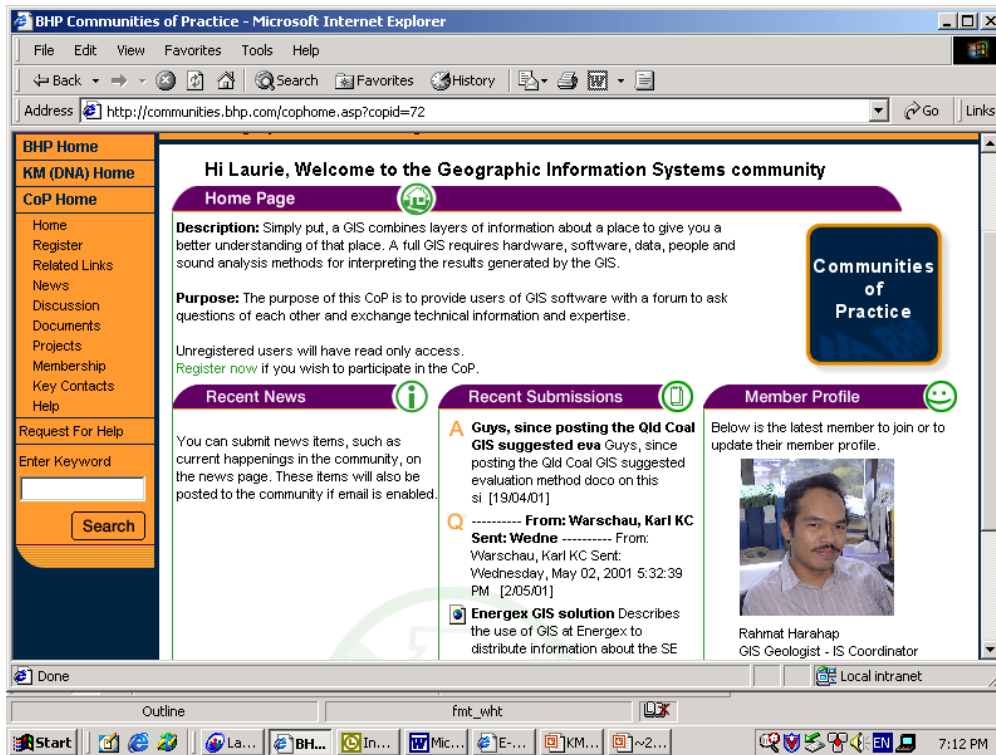


Figure 3 – The BHP Billiton CoP Tool

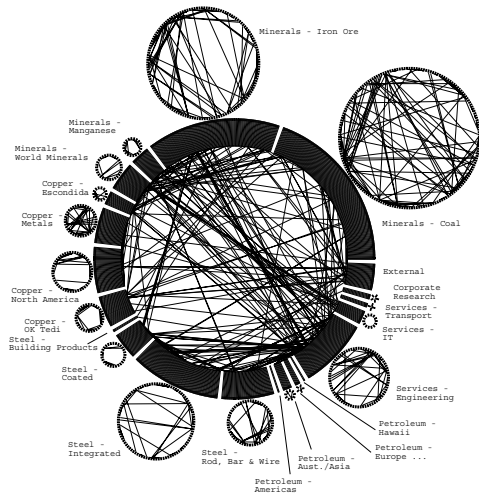
The CoP tool has now been in operation for over 2 years, during which time close to 200 communities have been formed with over 2,500 members. Figure 3 illustrates a typical CoP shared space. The tool menu on the left shows the functions for the sharing of documents, news items, member profiles, web links, project information, discussions on topics of interest and responses to specific requests for assistance. The most recent contributions are highlighted on the respective CoP home page. While the adoption rate is healthy, it still represents only around 10% of the potential audience of intranet users. It would also be naïve to assume that all of the established “electronic communities” were active CoPs. The CoP statistics on “hits” show that 20% of the CoPs represent close to 70% of the activity, so it is still early days for the effective adoption of the tool.

Measuring and Monitoring CoP activity

While concepts of CoPs and measurement may seem incongruous to some, in the corporate context any investment needs to demonstrate a return, which invariably means measurement and/or benchmarking. That said, measurement systems need to be sensitively designed to complement, rather than undermine the essentially voluntary nature of CoPs.

In this context, statistics collected from the CoP tool usage are used by the co-ordinating team to assist with “nurturing” more so than the “control” of CoP activity. BHPB have also made use of Social Network Analysis (SNA) to help assess the “health” of its CoPs. Prior to the launch of the Global Maintenance Network (GMN) in late 1997 SNA was used to provide an “as-is” picture of knowledge sharing relationships amongst maintenance engineers world-wide. The GMN was the result of the amalgamation of several divisional maintenance engineering networks, numbering

some 2,000+ engineers. SNA is a technique for mapping relationships within an organization or group. Some 1,000 engineers were asked to nominate their “trusted advisors”, to assist in developing the relationship map (Figure 4). The analyses identified potential weak points in the Network, providing opportunities to “engineer” some collaborative activities to help strengthen the Network (Lock Lee, 2001).



This figure illustrates the knowledge sharing connections between and within business units. The satellites represent different business units and connections within those units. The links between the arcs in front of the satellites indicate inter-business unit connections. Each line indicates a link between two individuals.

A key finding from the study was that formal business unit boundaries are far greater barriers to knowledge sharing than geographic separation. For example, a particular business unit had more numerous connections between operations spanning the Pacific ocean, than to peers in other business units who were geographically co-located.

Map produced by software from Netmap Solutions

Figure 4 – Global Maintenance Network Connections

The GMN also operated the Company’s most successful on-line discussion group. Some experiments were conducted with using discussion data to non-intrusively map connections over time. Figure 5 illustrates the evolution of CoP electronic interactions over time from the GMN launch. While the results were preliminary it was felt that the data did reflect to a reasonable extent, the nature of the activity in the Network.

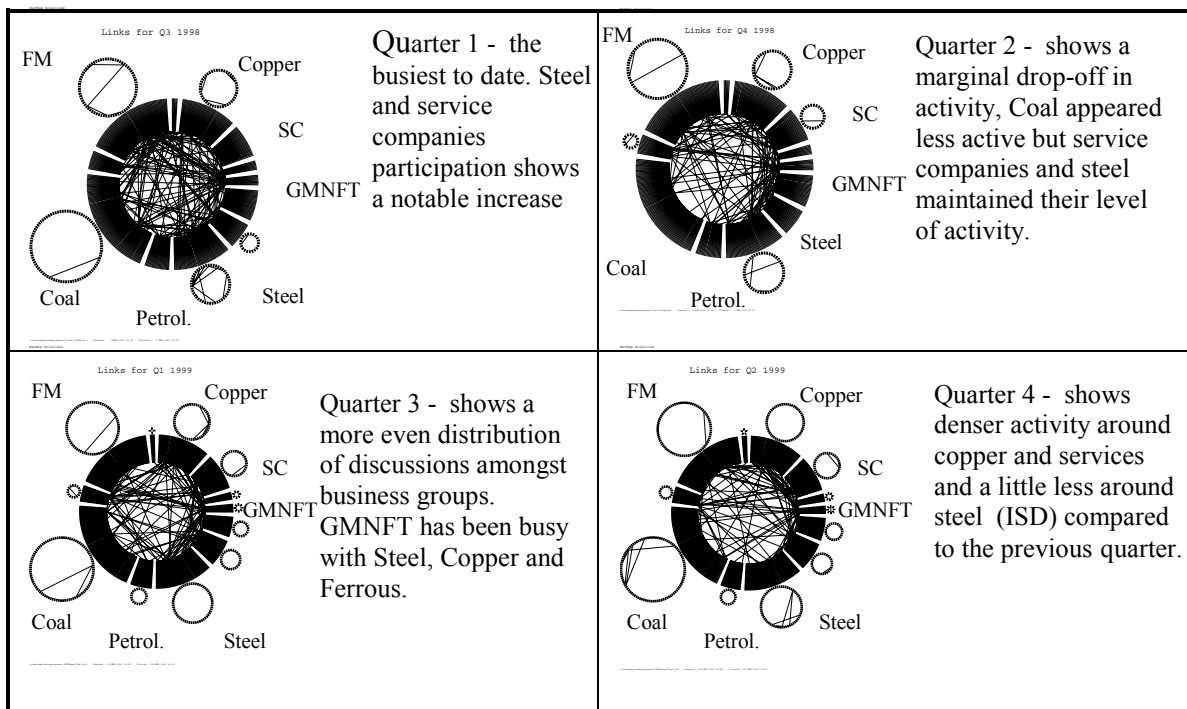
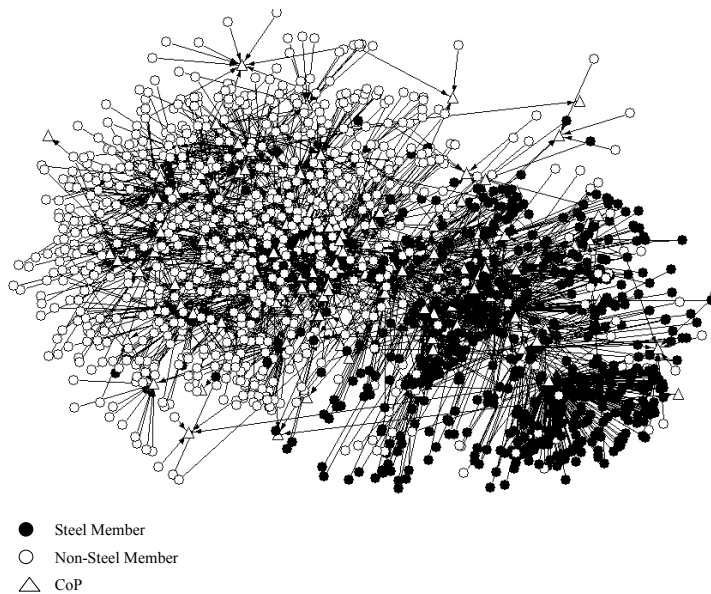


Figure 5 – Discussion Group Activity – Over Time.

BHP Steel Divestment

The formation of the Global CoPs in areas like maintenance, safety and project management were aimed at facilitating collaboration across business divisions. They have been quite effective in quickly assimilating new acquisitions. Divestments however, have the potential for undermining Global CoPs by removing potentially key members. In April of 2002, the re-structuring of the BHPB business was completed with the divestment of the BHP Steel division. The business separation was conducted over a 12 month period. The impact on the BHPB CoP programme was one of the considerations in the process. The Steel division initiated CoPs within BHPB were the most mature users of CoPs. To understand the potential impact on the CoP programme (specifically where CoPs with cross divisional membership might be undermined by the loss of Steel members), the CoP tool membership data were used to identify CoPs at risk (Figure 6).



This “map” provides an overview of CoP membership as extracted from the CoP tool. The black circles are BHP Steel members with connections to CoPs (triangles). One can clearly see the polarisation of “Steel” CoPs, which was good news for the separation as the impacts would be minimal.

Map produced by the Pajek software

Figure 6 CoP membership by Business Division

For the identified “CoPs at risk”, the CoP leader was interviewed to assess the potential impact of losing steel members from the CoP. With the separation, BHP Steel now has its own copy of the CoP tool, with the majority of CoPs operating and unaffected by the change.

BHP Billiton Lessons Learnt

Technology enablement of BHPB CoPs began in earnest from the 1980s to the point now where Communities have literally a smorgasbord of support technologies to choose from. The major lessons from this experience could be summarised as:

- For CoPs, technology use is discretionary. There is no single “best support tool”. The differing styles and cultures across communities will often dictate the style of support they will seek;
- Face-to-face events are absolutely essential to successfully launch and sustain a community. The value in the use of technology may simply be in sustaining activity between meetings;
- CoPs will use a mix of technologies, driven by what is pragmatic for the group overall. To ensure no member is disadvantaged they will often choose the lowest common denominator (perhaps explaining the continued popularity of e-mail and the telephone);
- For effective CoPs, technology is not a barrier. For ineffective CoPs its always a barrier;
- Trying to launch a CoP by first establishing a “shared electronic space” will often fail. It needs to be people engagement first, then technology support following as a response to a demand;

- New technology introduction needs champion/s to sustain its use beyond the inevitable teething stages;
- Investment in technical support is critical. New technology will often fail. If support teams can have it up and running again quickly, then frustrations will be minimised. Coaching in the “social protocols” of virtual work can also help CoP members to quickly become more comfortable with a new media. BHPB’s experiences with Video Conferencing (both room based and desktop) reinforce the above; and
- Technology enabled CoPs can be an effective vehicle for corporate departments in developing and then implementing global initiatives, where cross business activities are the norm e.g. safety practices, environmental practices, project management etc..

The CSC Story

Computer Sciences Corporation was founded in 1959 and is one of the World's leading consulting and information technology service providers. CSC has grown rapidly through IT outsourcing acquisitions in the past decade. Now with over 65,000 employees operating in some 700 sites and 70 countries, the need for an effective knowledge management environment had been apparent from an early stage.

Communities of Practice (called Knowledge Communities within CSC) are one of the four quadrants which make up CSC's Knowledge Environment:

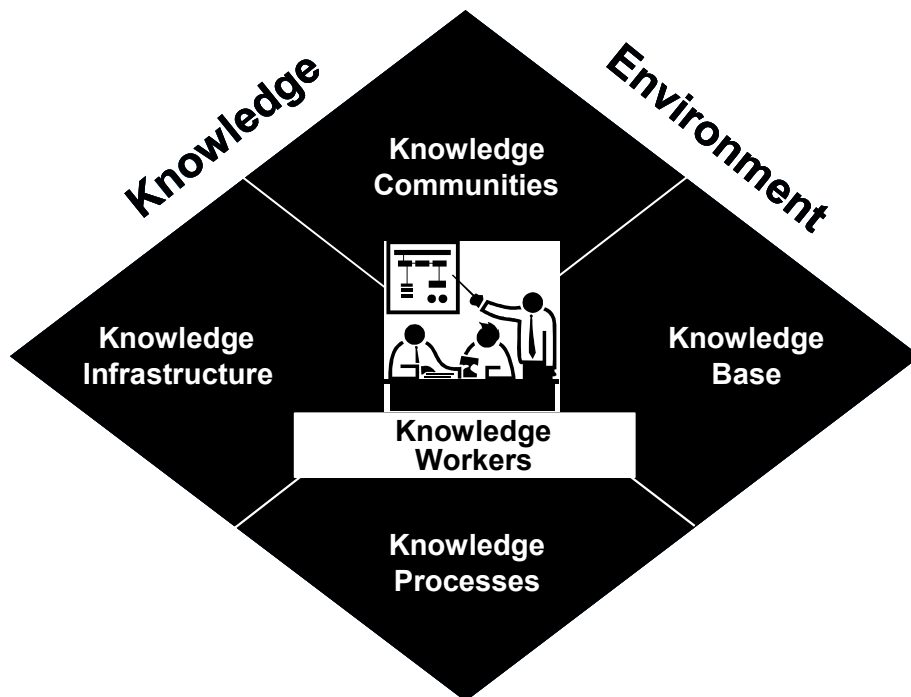


Figure 7 – CSC's "Knowledge Environment"

- **CSC's knowledge communities** are horizontal communities of experts and practitioners that cooperate to build and share knowledge around business topics that impact the organization's performance or ability to adapt to business changes. These communities play an important role in building and accelerating the flow of tacit knowledge within the company. They support business developers and delivery managers seeking expertise to address challenging business problems. They support practitioners in developing their own knowledge and expertise. They provide a forum for collaboration that accelerates the rate at which the organization innovates and enables CSC to maintain its' thought leadership in disciplines important to its success.
- **Knowledge Base.** CSC's knowledge base captures explicit knowledge, providing CSC employees with the information, methods, learning programs, and tools that enable them to work effectively in cross-organizational teams. Communities play a key role in organizing the knowledge base to meet the needs of their members and in maintaining the business value of the knowledge base over time.

- **Knowledge Infrastructure.** CSC’s knowledge infrastructure provides employees with the tools needed to participate in knowledge communities and to take advantage of their services.
- **Knowledge Processes.** Processes for aligning investments in the knowledge environment with the strategy and goals of our business, launching and operating knowledge communities, managing the quality and structure of the knowledge base.

CSC Community Evolution

CSC’s experience with communities stretches back over a decade. Early on, CSC focused on stimulating communities of interest — informal groups focused on networking practitioners. They then chartered expert groups and gave them specific responsibilities for reviewing and recommending best practices, engineering new knowledge assets and supporting requests for assistance from business developers, practitioners and delivery teams. They expanded expert groups into expert and practitioner networks to diffuse expert group results more effectively. Then CSC began to look for means to strengthen the communities’ business focus and to align community investments with CSC business goals on both the global and local levels. They worked with community leaders to mature their processes for supporting and operating the communities. They explored different community funding models; funding for leaders, funding for members and funding of community projects. Some of its business units began to converge their organizational and community models.

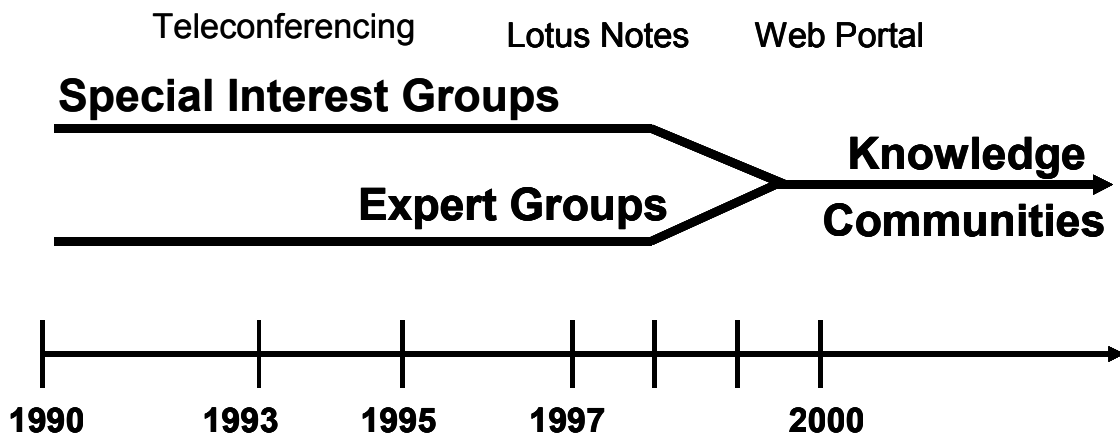


Figure 8 – History of CoPs within CSC

Today within CSC, knowledge communities number in excess of 500. These communities focus on business topics related to business development, business drivers, core competencies, solutions, market drivers, and/or industries. Other topics such as project management, system architecture, supply chain solutions, client relationship management, JAVA programming and outsourcing transition management. They include formal and informal communities. Formal communities are sponsored globally or at a business-unit level and are charged with specific goals such as the engineering of new knowledge assets, identification of best practices and recommendations for their use, demonstration of CSC’s thought leadership and point of view in external forums, mentoring practitioners, and identifying experts to assist

business developers and delivery managers in addressing client needs. Informal communities are sponsored by individuals and often focus on topics such as emerging technologies that may be critical to the business in the future.

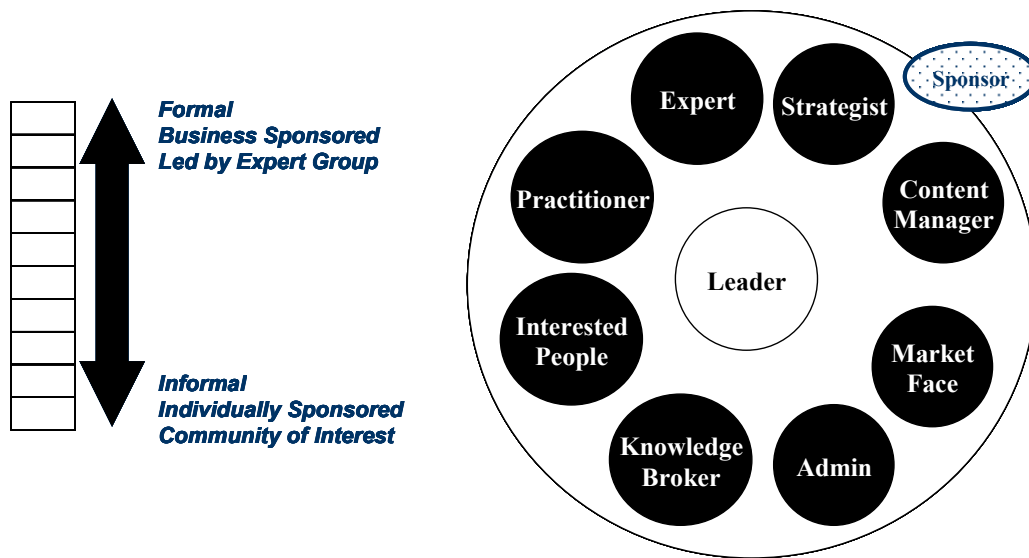


Figure 9 – Types and Roles of Communities in CSC

The larger, more formal communities will have members acting in most of the roles identified. For communities of interest there may simply be a leader and interested people. CSC has developed a methodology for launching, operating and supporting communities based on experience that stretches back over a decade. This methodology reflects its knowledge about the roles that a community must establish to increase its maturity and its business value to an organization — roles such as expert, practitioner, interested person, knowledge broker, content manager and strategist or thought leader.

| | |
|---------|--|
| Level 5 | Communities are responsible for delivering business results |
| Level 4 | Business value is clearly a focus of community action |
| Level 3 | Community leadership well established. Communities recognised as a source of thought leadership. Community processes and roles well established. |
| Level 2 | Informal communities in place. Community processes and roles not well established. Leadership issue is in early phases. |
| Level 1 | Some social forms may exist within the organization. |

Table 1 – CSC Communities – Levels of Maturity

CSC experience showed that communities grow through a natural evolution as they mature (Table 1). Communities initially focussed on connecting people and sharing knowledge, progressing to a focus on developing knowledge in support of key business initiatives and demonstrating thought leadership. Communities in their most mature form have directly impacted the strategy of the business; some have even become formal constructs within an organization, chartered with the delivery of business results. For example, the global systems architecture and global project management CoPs now have formal roles in establishing company standards and designing company wide training programmes.

CSC's focus has evolved into establishing joint communities with its clients and partners focused on topics of interest to them and making these communities accessible through shared knowledge environments.

Technology Use Evolution

From the early 1990's communities relied on teleconferences and e-mail to sustain their activities. The introduction of Lotus notes in the mid 1990's provided a richer environment for supporting communities, enabling customised repositories and discussion areas to be self-maintained by the communities. In 2000 CSC introduced an enterprise wide portal solution based on technology from Plumtree. The CSC portal is now a one-stop shop for enterprise information across CSC and provides a home for the knowledge communities as well as project teams and organisational units.

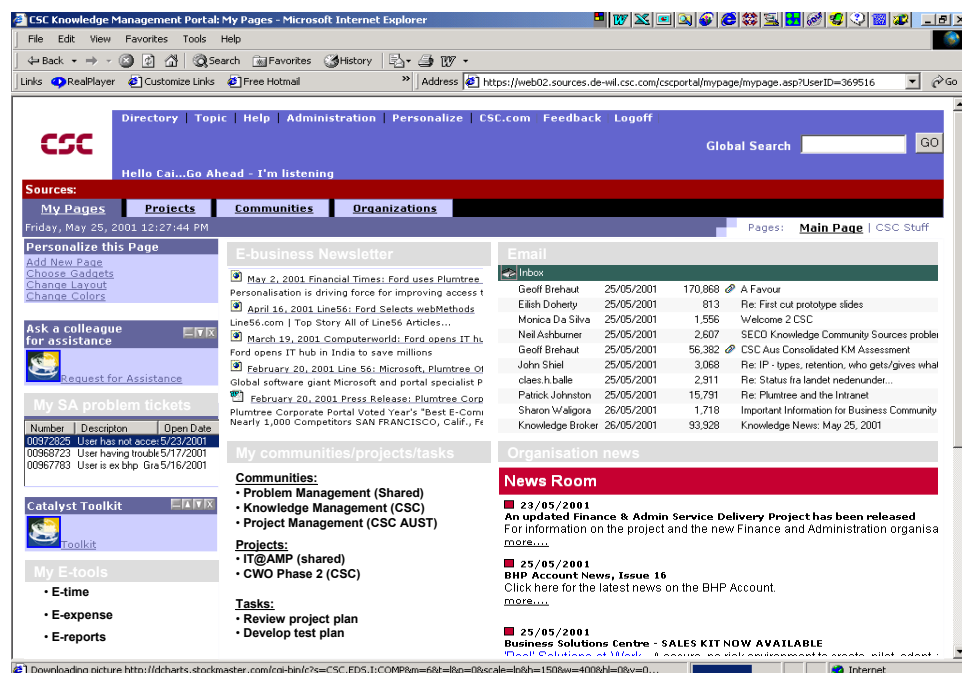


Figure 10 - CSC Portal

The portal provides communities with their own electronic space. Community members are able to post information “assets” informally into the “knowledge base”. These assets may be working documents or documents of general interest to the community members. A more formal process is used to post documents to the CSC enterprise wide repository. Assigned community members are used to vet information

assets for inclusion in the enterprise wide repository. The portal also supports community discussions, broadcasts and member lists.

Another powerful and often used feature of the knowledge environment is the “Request for Assistance” (RFA) function. This function enables staff members to post a request for assistance on any topic by addressing the request to those communities who are most likely to be able to help. The RFA repository can also be searched to see if your request has already been answered previously. Each community has a member assigned to facilitate the rapid response to requests for assistance addressed to their community.

The CSC Corporate Knowledge Programme (CKP) team has played a critical role in the establishment, awareness building, training and support of the technical infrastructure supporting communities. The CKP is a distributed team with key nodes in the US, Europe and Australia. The CKP effectively facilitates a formal knowledge community around the use and continued improvement of the knowledge environment.

In support of CSC’s growing focus on enabling community formation with its external customers, partners and suppliers, CSC has developed a web based tool called “e-KM” which provides a shared electronic space for communities which form across multiple organisations. e-KM can support multiple communities with basic functions for document and link sharing, discussions, news, personal calendar sharing and action tracking. An example of e-KM use is a cross organisation community formed to identify and prevent Medicare fraud in 12 western U.S. States. Called the Western Integrity Center, the community is made up of a geographically dispersed collection of experts in statistics, data base administration, programmers, special investigators, specialized nurses, a physician and an attorney.



Figure 11 – Western Integrity Centre Shared Community Space

What has CSC Learned about Communities?

- Successful communities require strong sponsorship, effective leaders and clear business alignment (both at a global and local level). For a global organisation like CSC, technology use is unavoidable. A standard environment like the CSC portal can greatly assist their operations, ensuring that no members are disadvantaged through lack of the appropriate tools.
- Providing access to the community support environment via the internet can ensure staff members working from client sites will not be disadvantaged by less than ideal connectivity with their community colleagues.
- Communities need social as well as professional interaction if they are to thrive. Social interaction is often only achievable for some, at the annual business and technology conference. Technologies can however help sustain energy between these annual events.
- Regular virtual “recharge” events are needed to keep the communities alive. Synchronous technologies are preferred, usually teleconferencing, sometimes supported by conferencing software. Video conferencing has proven problematical, too costly and not robust enough.
- Some communities like the CSC Research Services Alliance network have been using instant messaging (IM) to assist with sustaining contact. Experience to date is that IM is not for everyone, with usually only a core regularly making themselves available. Social protocols need to be developed e.g. how do you leave a chat session without appearing rude. Again this tends to be less of an issue if the members are well known to each other i.e. social interactions have previously been had.
- In developing shared knowledge environments for inter-company communities, CSC found it was far simpler to make use of a completely separate tool hosted on the internet, than to try and extend its internal portal

for external use, where security issues became quite problematical. Additionally, community participants are likely to feel more comfortable in using an “independent” tool.

- Measurement systems around community participation and activity are a useful proxy measure for the degree of business value achieved. Anecdotally, the most active communities are generating the most business value.

Common Themes and Lessons Learnt

BHP Billiton and CSC are quite different companies with quite different staff profiles with respect to blue collar/white collar mix and levels of IT literacy. What they do have in common is the global nature of their respective businesses and their commitment to using CoPs as a primary vehicle for knowledge sharing across their global operations. As one might expect, CSC’s use of technology is much more pervasive than with BHP Billiton. Being a technology company whose assets are mainly human, CSC has invested heavily in ensuring that its people can connect with each other effectively. Penetration of usage is still relatively low with respect to potential users, with BHP Billiton CoP tool users being around 10% of the potential users and CSC’s at around 50% at the time of writing, but usage rates are still growing rapidly for both organisations.

Both organisations have developed customised environments to support their CoPs. The BHP Billiton system is built mainly with Microsoft Web Development tools and CSC’s systems using a mix of Lotus Notes and Plumtree. Both organisations use these tools to help monitor CoP activity as a proxy measure for business value, with BHP Billiton taking additional steps over the traditional “Number of members” and “Hits” measures to look at the social network nets implied by the data.

It is commonly accepted that CoPs are predominantly social artefacts and on the surface both organisations are performing equally well and facing similar challenges, independent of the level of technical sophistication. The common themes emerging are:

- Without face to face contact, CoPs will struggle to survive. Technology can at best sustain communities between face to face events and perhaps reduce the number of face to face events required.
- The technology choice needs to respect the “lowest common denominator” members such that no member is excluded from participation for technical reasons. One advantage CSC has is its fairly rich “base level”.
- Technology alone will not launch and/or sustain an effective community. Both organisations have a substantial number of ineffective CoPs i.e. have established an electronic space but have very little activity.
- Technologies must be robust and well supported. The slower adoption of newer technologies is more related to supportability than acceptance. The drop off in video conferencing use and the continued reliance on teleconferencing by both organisations is reflective of this.
- Measuring the business value of CoPs is problematical given their less formal mode of operation. Membership, activity levels and relationship maps have all anecdotally provided useful proxy measures for business value. Specific

“stories and anecdotes” appear to be the most useful mechanism for communicating business value from CoPs.

Summary and Conclusions

For global organisations like BHP Billiton and CSC the use of technology to help develop and sustain CoP activity is essential. Both organisations have undertaken some innovative technology developments to help facilitate their respective CoP programmes with varying degrees of success. Technology has clearly played an important role in enabling local communities to go global.

The common challenge for both organisations has been largely socio-technical. Both organisations have adopted new technologies, but at a slower rate than expected and without leaving behind the older tried and tested technologies. Despite CSC having a more sophisticated and pervasive technical environment than BHPB, both organisations’ CoP members would still nominate, in order of preference; face to face, teleconferencing and e-mail as the prime connectivity channels.

Perhaps the key lesson learnt by both organisations is that while experimentation with new technologies is encouraged, the rolling out of the next technical increment needs to be all inclusive (not just in some areas, to some people). Supportability is key. If time challenged community members are inconvenienced in any way, they will fall back to the tried and tested. Technology use by CoPs cannot be mandated, so the technology has to “earn its keep” by providing the appeal and reliability that CoPs could not do without.

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