Betsy Rolland
LIS 584
Dr. Kim
December 8, 2006
Term Paper

Introduction

> Knowledge has become the key to success. It is simply too valuable a resource to be left to chance. Companies need to understand precisely what knowledge will give them a competitive advance. They then need to keep this knowledge on the cutting edge, deploy it, leverage it in operations, and spread it across the organization (Wegner, p. 6).

As organizations focus more on ways to increase their knowledge management practices, they are increasingly utilizing social learning systems such as Communities of Practice. This paper will explore the similarities between scientific research collaborations (SRCs) and communities of practice (CoPs), as well as what lessons the relatively recent phenomenon of CoPs can learn from the more storied history of SRCs.

Scientific Research Collaborations

> Biotechnology can now be characterized as the industry in which scientific and product development processes are collaborative. …collaboration (of any kind and form) are crucial to the maintenance, development, and survival of the industry, of organizations within the industry, and of different scientists working in the industry and in related fields in universities (Oliver, p. 583).

As science becomes increasingly complex, researchers trying to solve the most perplexing problems are increasingly turning to collaboration. A definition of research collaborations is somewhat difficult to pin down. What exactly constitutes a research collaboration? To what degree does a person need to contribute in order to be considered a collaborator? Katz and Martin give the following description in their paper "What is research collaboration?" while acknowledging its limitations.

> All that we can do is suggest some putative criteria for distinguishing 'collaborators' from other researchers. The collaborators will normally include the following:
>
> (a) those who work together on the research project throughout its duration or for a large part of it, or who make frequent or substantial contribution;

(b) those whose names or posts appear in the original research proposal
(c) those responsible for one or more of the main elements of the research (e.g. the experimental design, construction of research equipment, execution of the experiment, analysis and interpretation of the data writing up the results in a paper

In some cases, the list of collaborators may also include:

(d) those responsible for a key step (e.g. the original idea or hypothesis, the theoretical interpretation);
(e) the original project proposer and/or fund raiser, even if his or her main contribution subsequently is to the management of the research (e.g. as team leader) rather than research per se

The group of collaborators will generally exclude the following:

(i.) those who make only an occasional or relatively minor contribution to a piece of research;
(ii.) those not seen as, or treated as, 'proper' researchers (e.g., technicians, research assistants).

Nevertheless, while the above criteria for distinguishing between 'collaborators' and other researchers may apply in many research circumstances, it is all too easy to identify exceptions to virtually all the above criteria in particular fields, institutions or countries. A research collaboration therefore has a very 'fuzzy' or ill-defined border. Exactly where that border is drawn is a matter of social convention and is open to negotiation. Perceptions regarding the precise location of the 'boundary' of the collaboration may vary considerably across institutions, fields, sectors and countries as well as over time (Katz, p. 8).

Thus, research collaborations involve two or more people working together toward on a project. Interestingly, they don't even need to be working toward a common goal, but rather sharing some aspect of the project, such as a key idea, a piece of equipment or funding.

Researchers are motivated to collaborate by a variety of factors. "[I]ndividual-level studies of researcher collaboration show us that collaboration choices are governed by a wide variety of factors including inter-institutional structures (Landry and Amara, 1998), formal (Wen and Kobayashi, 2001) and informal (Bozeman and Rogers, 2002) research networks, research alliances and covenants (Pisano, 1991; Rogers and Bozeman, 2001), and arrangements for sharing expensive or scarce scientific resources and equipment

(Kevles, 1995)" (Boardman, p. 6). Some of these motivating factors are social choices, some are economic choices, but they are virtually always voluntary choices.

One of the most interesting things about research collaborations is that they are, at their very essence, Knowledge Management Systems. If we define a Knowledge Management System as any system (technological or otherwise) that enables an organization to manage its knowledge and generate new knowledge, then scientific research collaborations definitely qualify. "The goals of scientific collaborations often have a strong focus on knowledge generation, basic research, sharing of resources, interactions with the community, and career development for post-docs and graduate students" (Corley, p. 981). The entire *raison d'etre* of scientific research is to move the field forward by generating new knowledge.

The organizational structure of science is very much geared toward knowledge management. The vast majority of cutting-edge science takes place in universities around the world, though this is increasingly done in collaboration with industry, especially in the world of biotechnology. University science departments are charged with not only doing this cutting-edge research but also producing new scientists. The post-doc system means that the flow of ideas (a key aspect of knowledge management) from one laboratory to another is constant.

Innovation frequently comes from applying solutions from one domain to problems in another, as we saw in the case of Ideo**.** The increasing complexity of scientific research means that more research collaborations are interdisciplinary. "The advantage of interdisciplinary collaborations lies in their ability to enhance the interplay between tacit and explicit knowledge, from various scientific areas that is considered a central feature and requirement in individual and organizational learning processes" (Oliver, 586). The different epistemologies of different fields means different approaches to solving problems.

One of the key ways that scholars studying SRCs measure collaborations is through bibliometric analysis, the measurement of co-authorship of publications. While Katz and Martin question the legitimacy of this method, it is by all accounts the simplest, most verifiable way to measure research collaboration. The assumption is that if multiple authors are listed for a publication, they have collaborated.

There are great benefits to collaborating on research. Researchers are able to take advantage of the skills and knowledge of one another, learn new skills and methods (especially tacit knowledge), challenge their own thinking by collaborating with scientists with different viewpoints and backgrounds, work with others who are passionate about the same interests, gain new contacts, and potentially gain greater visibility for their work (Katz, p. 15). As with any social construct, there are also possible costs. These could include additional expenses when the team size increases or when travel is necessary, an increase in the time needed to do the research due to increased negotiations over meaning and results, increased administrative needs and costs and reconciling different cultures if the collaboration involves more than one entity such as a university or research center. (Katz, p. 16).

Scientific research has shown itself to be incredibly adept at the generation of new knowledge, managing that knowledge and learning continuously.

Communities of Practice

Etienne Wegner, one of the pioneers in the field of Communities of Practice defines CoPs thus: "Communities of practice are groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wegner, p 4). Because most are informal or at least not a core part of a person's job, they generally do not have formal structure and goals (Annabi, p. 2). People generally get involved in CoPs because they meet a need the person has to connect with others in a certain domain, whether professional or personal. They are generally voluntary.

The concept of CoPs was introduced by Lave and Wegner in 1991 and has been increasing in popularity ever since. "Its popularity has been fuelled, in part, by the realisation that knowledge is heavily social in nature" (Chua, p. 120). Case studies abound of successful implementation of CoPs in a wide variety of organizations. Wegner et all describe a structural model of CoPs in their 2002 book *Cultivating Communities of Practice*. The elements of this structure include a *domain* of knowledge, a *community* of people and a shared *practice*. The domain "creates common ground and a sense of common identity," the community "creates the social fabric of learning [by fostering] interactions and relationships based on mutual respect and trust," and practice provides "a set of frameworks, ideas, tools, information, styles, language, stories, and documents that community members share" (Wegner, pp. 28-29). This emphasis on the people within the CoP supports Chua's assertion that knowledge is social in nature.

One of the primary roles a CoP can serve is aiding in the process of transferring knowledge to less-experienced members. "New and non-expert members of a community learn through interaction with and observation of expert members in the community and eventually become contributing members and full participants" (Annabi, p. 3). This transfer includes tacit knowledge organizations constantly struggle with communicating to its new members. Explicit knowledge such as how to submit a design proposal, how to create a client invoice or design a brake system can be reduced to a set of steps, but the tacit knowledge involved is more difficult to communicate. CoPs can help in that they allow new members to see what is valued by the organization, what details need extra attention and other assumptions inherent in the culture of the organization. One final bit of tacit knowledge that can be communicated through CoPs is leadership skills. An organization needs a constant flow of new leaders in order to survive and move forward. CoPs can help in that by allowing more senior members to lead by example.

Collaboratively working through problems within the culture also strengthens an organization. It creates camaraderie and aids in the constant evolution of the culture, hopefully toward a more evolved future.

Similarities and Differences Between SRCs and CoPs

Similarities:

Despite being most prevalent in different settings, there are many similarities between SRCs and CoPs.

- One of the greatest similarities between SRCs and CoPs is the way in which both transfer knowledge from experts to non-experts. In CoPs this is done through basic interactions of the CoP, while in SRCs it is generally more formalized, as professors mentor graduate students and post-docs. As discussed above, it is crucial for the future of any organization to have a constantly developing pool of talent and future leaders.

- The motivation for both SRCs and CoPs is similar – to solve problems by sharing information and knowledge. CoPs leverage knowledge that exists within an organization so that it can be put to use on current problems. SRCs also generally exist to bring together existing knowledge and apply it to a new research problem, with the goal of generating new knowledge.

- Both SRCs and CoPs have the potential for great innovation as people from diverse backgrounds and experiences come together to work on a problem or apply their skills to a field.

- Participation in both SRCs and CoPs is primarily still a voluntary activity. While some government funding agencies are pressing research scientists to work collaboratively, most do so voluntarily because of the potential payoff.

- In many cases, both SRCs and CoPs are dependent on the person running the show. As Annabi found in her paper, the success of the PAN depended heavily on the person charged with its maintenance. Those that had more involved PAN leaders were more active and more successful. "[E]fforts are initiated and carried

out by PAN coordinators and PAN coordinating committees making the leadership of the individual PANs the main factor in their success and contribution to the business objectives of the organization (Allabi, p. 5). SRCs depend on the skills of the Principal Investigators in getting funding and keeping things running smoothly.

- Both SRCs and CoPs have a strong dependence on technology to negotiate collaboration over distances.

- Both SRCs and CoPs have been recognized as tools for encouraging the development of innovation and new knowledge and are both increasing rapidly in popularity.

Differences:

There are also many differences between these two forms of social learning.

- One of the key differences between SRCs and CoPs is the reward system. For academic research scientists, tenure depends, at least in part, on their publishing output. The more knowledge they share via publishing study results, the more their careers advance. This a clear, unambiguous incentive system. Additionally, tenure offers some protection for academic research scientists. With enough funding, they have the freedom to explore avenues that may turn out to be dead-ends without fear of losing their jobs. Conversely, CoPs are generally an extra part of a person's job in a business setting and there is no failure protection. Because they are voluntary and considered extraneous to an employee's job, rewards are rarely tied to participation in CoPs. This, of course, has the effect of possibly dampening interest in strong participation. Most employees are already working more hours than ever before; without an incentive system that rewards participation, CoPs can never fulfill their potential.

- Research scientists are committed to the development of their fields and share knowledge even with scientists in "competing" labs. They are committed to their own work and their own institutions, but they have a higher commitment to the overarching pursuit of science. Members of CoPs, on the other hand, are committed first and foremost to their company and their own careers, at least in the business world. Sharing knowledge with competitors is not only discouraged, it may actually be illegal in some cases. This creates a strong disincentive for sharing with others in the field outside of one's company for the sake of the development of the field.

- CoPs are a fairly new phenomenon, whereas SRCs have a long history. While there may be plenty of room for improvement, the current system of SRCs does fairly well at achieving the goal of generation of new scientific knowledge. COPs have yet to achieve their full potential in most cases.

- While SRC are increasingly interdisciplinary, they are still mostly comprised of research scientists with an experimentalist background. Communication between, for example, a molecular biologist and a microbial geneticist may be tricky, but at least both have similar outlooks. CoPs on the other hand, can be made up of members from wildly diverse backgrounds, even though they're focused on one topic of interest. This can create significant problems if the CoP doesn't create a common language and culture or if the group lacks boundary spanners.

- SRCs generally have a final, tangible goal, whereas CoPs are ongoing. Most SRCs are organized around a research question and have a goal of answering that question, with the byproduct of publications. CoPs exist more as a forum for discussion and sharing information or knowledge.

- CoPs generally are not an employee's main focus but are instead a tool the employee uses to do her job better. SRCs may or may not be a researcher's main

focus, depending on the type of collaboration. Researchers generally have one main employer – either an academic institution or a company – but can be involved in multiple collaborations, involved in inter-institutional collaborations or can be involved in one main collaboration. This may be in addition to teaching responsibilities or not. The role that CoPs play in the life of an employee is more consistent across companies than the role of the SRC is across institutions.

Lessons Learned

What, then, can CoPs learn from SRCs? I have the following recommendations:

- As we've discussed repeatedly this quarter, communities of all types need to align their reward systems with their goals. If the goal of a CoP is to share and disseminate knowledge, then the reward system needs to be tied to that. As discussed above, research scientists have a very compelling incentive to publish and share their knowledge. Not only do they receive tenure based on their rate of publishing, they also receive more grant funding and greater status in the scientific community. That greater status, of course, then leads to more grant funding and more opportunities to collaborate. This is a powerful rewards system.

  While companies don't need to award tenure to employees for participating, creating a system where employees are encouraged to spend, say, 10% of their time contributing to their CoP could be all it takes to encourage significant participation. Maybe with each year of seniority in the field or in the organization, an employee increases the percentage of his time spent on knowledge management tasks such as mentoring non-expert employees, creating knowledge base-style articles, leading CoPs. Those who contribute more high-quality work to the KM activities are rewarded both financially and through status increases. This shows that organizations truly value their knowledge and the generation of new knowledge by rewarding it.

- CoPs should have specific goals for collaboration, with success criteria and metrics. What makes this specific CoP successful? How is this CoP contributing to the overall success of the organization and the success of its members? As a corollary to that, CoP members need to be fully committed to the goals of the CoP. Research scientists working on a research problem are fully committed not only to achieve that research goal, but to the advancement of science, as well.

- One of the things that makes science so successful is its commitment to training new members of the field. Collaboration between senior and junior scientists benefits both parties and is the lifeblood of the science world. There is a significant amount of tacit knowledge communicated in these relationships. Adding this type of formalized collaborative relationship between expert and non-expert members would go a long way toward increasing the value and success of CoPs. It also has the added benefit of ensuring the long-term success of the organization, as the expertise of senior members is not lost with their retirement or exit from the organization.

- CoPs are frequently technology-based, relying more heavily than perhaps is healthy on electronic methods of communication. While SRCs also utilize technology, they also seem to recognize that it is simply one tool of many to accomplish their goals. Perhaps CoPs need to augment their methods of interaction.

- Research scientists attend conferences. Perhaps CoPs need to hold regular meetings. As mentioned above, while technology can greatly enhance communication over long distances, there is still no substitute for face-to-face meetings and discussions.

- CoPs need to develop a culture of their own, including language, rules of engagement and shared customs. Because research scientists go through

extensive training in their respective fields, they have absorbed the culture of their discipline and enter a research collaboration already understanding what is acceptable, how to work and how to interact with their collaborators. As members of CoPs can come from disparate fields, they may not share a culture. In order for the CoP to be truly successful, this should be remedied.

Conclusion

Scientific research collaborations and communities of practice, then, share a number of defining characteristics, including a stated goal of sharing knowledge. While there are similarities between the two types of communities, there are also substantial differences, mainly stemming from the differences between their main arenas. SRC are most prevalent in academic institutions, whereas CoPs are more common in the business world. As SRCs have a successful track record of many years, CoPs may be improved substantially by learning lessons from SRCs.

Bibliography

Annabi, H., Arnold, P., & Rivinus, C. (2006). Towards Alignment of Communities of Practice with Business Objectives: The Case of Parsons Brinckerhoff. *Working Paper*.

Boardman, C., & Bozeman, B. (2003). Implementing a "bottom-up," multi-sector research collaboration: The case of the Texas Air Quality Collaboration. *Economics of Innovation and New Technology*.

Chua, A. Y. K. (2006). The rise and fall of a community of practice: a descriptive case study. *Knowledge and Process Management, 13*(2).

Corley, E. A., Boardman, P. C., & Bozeman, B. (2006). Design and the management of multi-institutional research collaborations: Theoretical implications from two case studies. *Research Policy, 35*(7), 975-993.

Katz, J. S., & Martin, B. R. (1997). What is research collaboration? *Research Policy, 26*(1), 1-18.

Oliver, A. L. (2004). Biotechnology entrepreneurial scientists and their collaborations. *Research Policy, 33*(4), 583-597.

Wenger, E., McDermott, R., & Snyder, W. (2002). *Cultivating communities of practice : a guide to managing knowledge*. Boston, Mass: Harvard Business School Press.