Unleashing the Power of Networks - Case Study

Guillermo Velasquez
Halliburton
Houston, Texas 77042

and

Peggy Odem
Halliburton
Houston, Texas 77042

ABSTRACT

As market forces continue to push the envelope of productivity and performance, developing a well-trained and highly skilled work force is considered one of the most important business differentiators in the market place. A recent survey [1] indicates that informal training accounts for over 70% of all the training an individual gets in his/her job. These data emphasize the importance of having a training system in place that can fulfill the needs of the work force in a timely manner. Halliburton Energy Services has developed a system of communities of practice to strengthen organizational and individual development. This paper discusses how this training system is transforming the culture and the way it does business.

Keywords: Knowledge Management, Communities of Practice, Social Network Analysis, Knowledge Broker, Organizational Learning.

INTRODUCTION

We define Knowledge Management as the systematic approach to get the right information to the right people at the right time. A community of practice is a group of people who share the same professional interests, learn from each other, and help each other solve their own problems. People frequent these communities because they learn about issues that pertain to their jobs [2].

In the summer of 2001, Halliburton Energy Services initiated implementation of knowledge management (KM) to support the company's vision. The KM initiative had two main goals: improve service quality and mobilize innovation. In the past four years, 19 communities have been launched and this initiative has proved to be a turning point for the organization.

Before this initiative, support for the field organization was

based on a helpdesk or a hub model (Figure 1) wherein an employee with a technical problem would contact an expert at one of several centrally located Technical Services groups. Outside of this one-on-one exchange, communication was
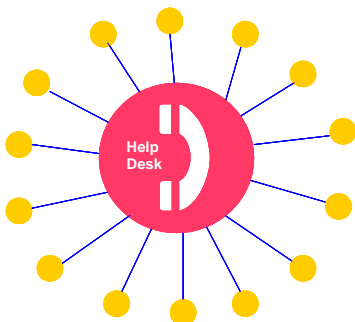
Figure 1

almost non-existent. The launch of the KM initiative, established new communication channels that have enabled a greater flow of business information and resulted in significant performance improvement.

CASE STUDY OF A KNOWLEDGE COMMUNITY

In 2002, a global community with members from sales, technology, manufacturing, maintenance, operations and other support groups was launched. Within one year, the following results were achieved:

- Customer dissatisfaction was reduced by 24%
- Cost of poor quality was reduced by 66%
- New product revenue was increased by 22%, as adoption of new technology accelerated [3]
- Virtual capacity created averaged 4.1 hours per user per week, equivalent to 10% productivity improvement

A successful KM starts with a compelling business case [4,5]. In this study, almost 4% of the business unit's profit went towards rework and waste with the potential for significant increases in the future due to improvements in technology and tool design. To address this problem, management sponsored the development of a knowledge community. The working group, consisting of four people from the business unit together with the KM core team, worked for three months to develop and deploy the community.

USING ORGANIZATIONAL NETWORK ANALYSIS

An Organizational Network Analysis (ONA) performed during the development of the community was an integral part of the process. The ONA provided a greater understanding of how knowledge and information flowed within the group. The ONA showed that there was a high degree of dependence on three technical experts (**Fig. 2**, inside the yellow oval). Each node represents a person in the network; the lines represent the connection between individuals who share knowledge and information. The arrows point to the knowledge providers.

Technical problems from the field were handled by contacting an expert in the Technical Services Group. Many of these requests for information were repeat questions that the technical experts had responded to previously. Although the primary focus of the technical experts is to increase the knowledge of their discipline, when interviewed, they said that they spent most of their time responding to repeat questions.
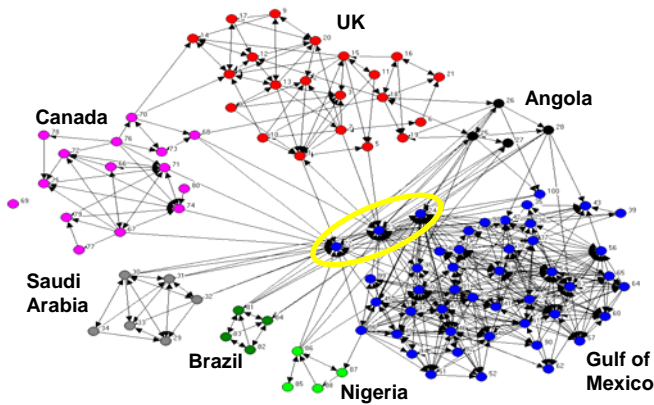
Figure 2

A simulation conducted within the ONA illustrated that when the three technical experts are removed, there is a small degree of connection across the field operations (**Fig. 3**). The few remaining connections between the countries could be traced to individuals who had previously worked in another country. For example, the connections between people in the Gulf of Mexico and Angola were due to four individuals in Angola who had previously worked in the Gulf of Mexico.
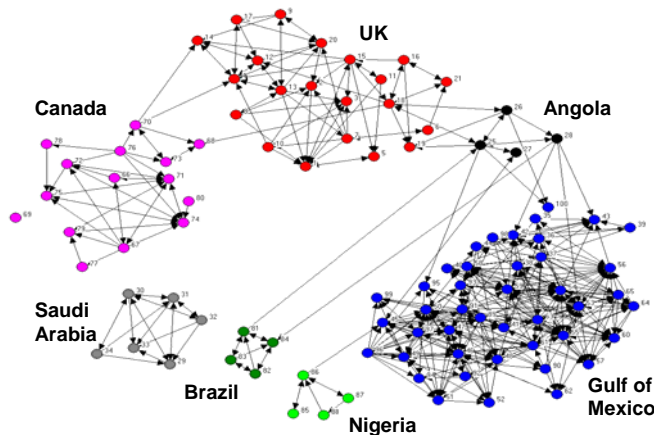

Figure 3

Another compelling reason for starting a community surfaced during the interview process of the ONA. At the time Operations personnel in the Gulf of Mexico (USA) were reducing their costs (50% during the previous 12 months), other regions/countries involved in the ONA saw a 13% increase in similar costs.

While the technical experts were in an excellent position to spread these practices to others, they were unable to do so since they were overwhelmed with repetitive requests from the field. Ideally, the field staff will consult the technical experts for their demonstrated knowledge and ability in their discipline [6]. However, while many operations employees were aware of the existence of such technical experts, they did not have a sufficient personal relationship with or trust in them to actually communicate with them. In one instance, the ratio of operations personnel who knew a technical expert versus the operations people the expert knew was six to one. This ratio underscores the concept of competence-based trust — which focuses on ability.

The ONA further indicated a lack of personal relationships between the field staff and technical experts: the technical experts were not reaching out to those in the field. These personal relationships are the foundation of benevolence-based trust[6]. Research has shown that networks in which these two types of trust are present have more robust communication and superior knowledge transfer.

Some key interventions helped produce the improvements reported at the beginning of this case study. The first was to develop a thriving community as will be described in this paper. A second, based on findings from the ONA, involved strategic personnel transfers between countries. The individuals selected were nationals in their home country, who had been identified with high-growth potential. These personnel transfers served two purposes: (a) professional development of the selected individuals and (b) reinforce the organizational network by establishing new connections between people in different countries.

DEGREES OF SEPARATION

One of the metrics of the community obtained from the ONA is known as 'Degrees of Separation'. A degree of Separation is the average number of people between the individual in need of knowledge or information and the person who has that knowledge or information [7]. Twelve months after the community of practice was established, the degrees of separation within the community were improved by 25% (**Fig. 4**). Although 25% may not seem like much, we are not attempting to have everyone talking to everyone. Instead, we want to make sure that the important business conversations needed for improvement do take place. In this particular case, we needed the good business practices from the Gulf of Mexico operations flowing out to the rest of the field operations.
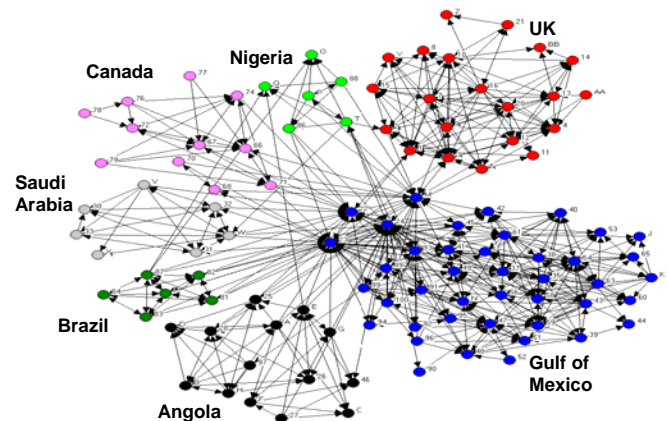

Figure 4

When launched in September 2002, the community had 200 members in six different countries. Early indicators showed the potential value resulting from a global community and a new one was established. By April 2003, the global community had 450 members (**Fig. 5**). This enhanced community resulted in a daily sharing of knowledge and information and problem solving between individuals on a global scale with a much lower involvement of the Technical Services group. Users participate in the knowledge community because they get quicker and high-quality answers to their questions and issues faster than

previously. The technical experts saw a noticeable reduction in repeat questions asked as the easier, 'how-to' issues were now being answered by the community.
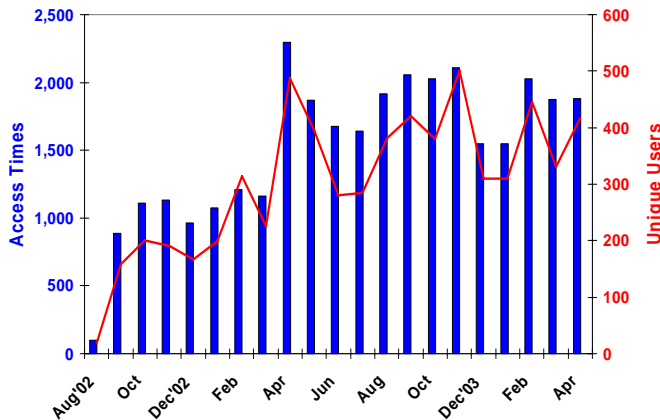

Figure 5

VALUE CONFIRMED

A second ONA was performed one year after launching the community to determine the value of the information gained from participating in the community. Twenty-five percent of the community was surveyed with an 81% return rate. The following is a summary of the results:

- The community portal is used by 83% of the participants to find information

- Users said that the community portal was useful 98% of the time

- Users said that they found the information they were looking for 91% of the time.

The success of the 19 KM communities demonstrated the effectiveness of the detailed process used to develop them. [2] The following are examples of testimonials expressing the value of the community:

- Finding solutions without having to spend time searching. Finding work methods and service standards without having to create them from scratch.

- Through collaboration, new and fresh ideas are introduced, thus, the solution to a problem or answer to a question is usually easy to find. We have a lot of brilliant people working in [this company] from all over the globe. Collaboration brings the ideas together.

- Quick way to get opinions from around the globe on a problem encountered locally.

- Quick response for technical expertise. Better sharing of experiences in typical or special applications.

- People with knowledge answer the questions, promptly responding to the inquiries most of the time.

- It provides easy access to experts and encourages sharing of best practices.

- Someone knows the answer - who and where they are, is always a mystery, but now I know where to ask the question.

THE FLOW OF KNOWLEDGE AND INFORMATION

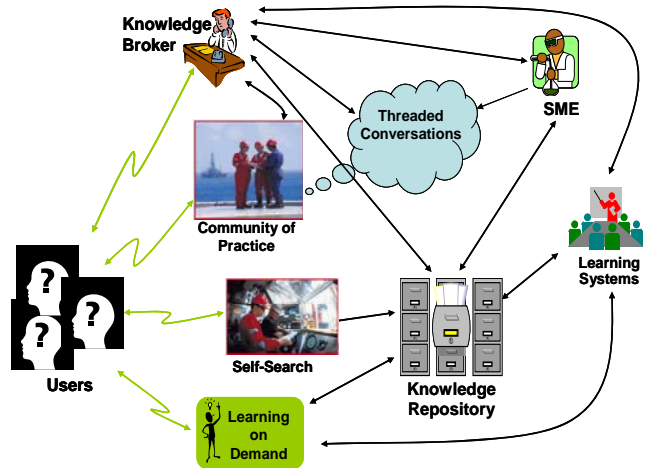Figure 6 illustrates the primary activities and elements of the community system.

Figure 6

First, let us assume that a user has a question. The user performs a self-search and looks in the Knowledge Repository for relevant information. If the user cannot find what she/he needs in the repository, then she/he posts the issue on the collaboration tool in the community portal. The community members can contribute suggestions, share experiences, and help clarify the scope of the problem until a solution is found.

The community of practice has a full-time "Knowledge Broker" (KB) who connects those who know with those who need to know. An important part of developing the community is identifying individuals around the globe who have specific expertise. The Knowledge Broker then connects those individuals with expertise to those within the community who need it.

Once solutions are validated by a subject matter expert (SME) and acknowledged as a viable solution by the user, the KB tags the solution with taxonomy attributes and metadata and places it in the knowledge repository for further use.

Another component of the community learning system not apparent in the processes described above is 'learning on demand'. As users access the community portal, there are new issues and questions posted to the collaboration tool daily. Users learn by reading the postings, comments and solutions of others, as well as their own. The collaboration postings and threaded discussions are a rich source of knowledge and information, and can be searched using the portal search tool. Users do not have to wait until this posting is placed in the knowledge repository to have access to it.
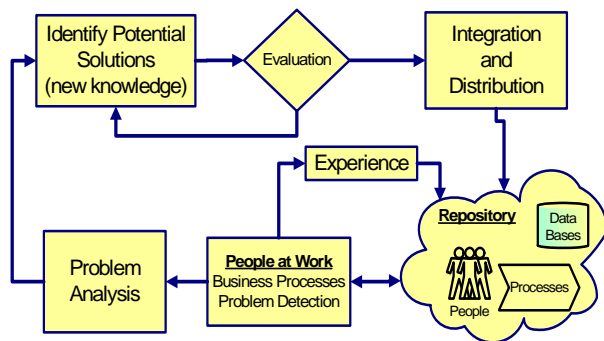
Traditionally technical documents do not contain enough context for users to fully understand the concepts, ideas and/or experiences so that appropriate applications can be made. Within the engineering environment of this organization this is more the case. By keeping the question with the solution and the

associated threaded discussion we are providing essential context that was left out in the past and users have found very useful.

The KB is in an excellent position to identify knowledge gaps in the community. The KB can provide feedback to Human Resources Development group or others who are responsible for organizational and technical learning systems. This feedback is valuable when designing or reviewing learning courses.

THE KNOWLEDGE LIFE CYCLE

We have adopted a simplified version of the knowledge life cycle model proposed by McElroy [8] to explain how knowledge is created and how it flows within the KM system. (**Fig. 7**) For purposes of this discussion, a knowledge repository contains not only databases and documented processes but also the knowledge and experiences of all the people within the organization as well as knowledge that is embedded in processes

used throughout the organization.

Figure 7

In the process of doing one's job a person will refer to what he knows or has previous experience with to complete a task and/or activity. If this referral process is successful, the task is completed without problem. This experience reinforces the individual's existing knowledge and/or experience and feeds back into the organization's knowledge repository.
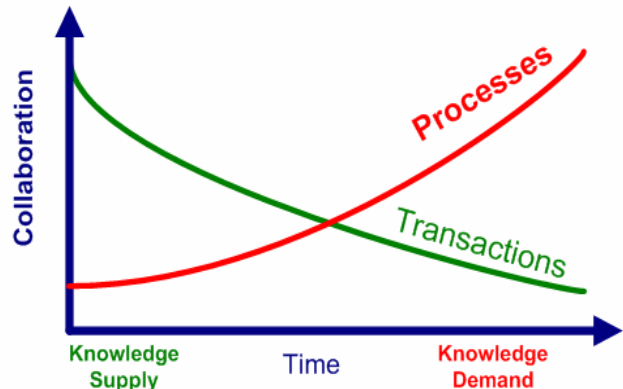
When problems are detected during the course of performing one's work a different set of processes involving problem analysis and solution development, come into play. The problem must be analyzed to determine root causes, cost-benefit impact, etc. This analysis is followed by identification of potential solutions and determination of the most appropriate one. Once this determination has been made, the solution, which represents new knowledge in the organization, should be distributed to all relevant parties and integrated into the work process; i.e., learning systems, company policies and procedures, and finally, recorded in the organization's knowledge repository.

COMMUNITY MATURITY MODEL

How does one know where a community is with regard to creating new knowledge? Using observations of the 19 KM communities, we developed a model to help us identify what phase a community is in and to determine whether or not an intervention is required. Further efforts may be needed to motivate community members to move toward knowledge creation, a compelling gauge of a mature community.
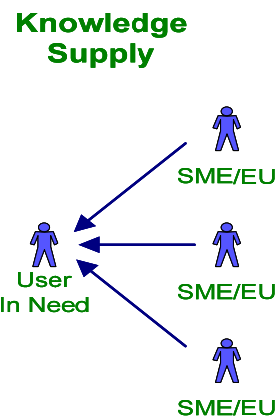
Figure 8

When a KM community is first developed, most community

members are looking for an experienced individual who can provide them with the information needed to complete a similar task or job. This early collaboration activity, where skilled people usually know the answers to questions, is usually focused around routine tasks. We consider this the 'Knowledge Supply' mode. (**Figs. 8** and **9**)

We have observed that in time as the KM community matures, that the basic 'How to' questions are replaced by questions involving issues or problems that lack established answers. This stage of the community collaboration is called 'Knowledge Demand' mode. A decline in collaboration activity in a community may be an indication that the community is moving from a knowledge supply phase into the knowledge demand phase. A review of collaboration discussions to learn the type of information members are looking for can help determine the community's appetite for new knowledge. It may be useful to speak with key community members to understand what is happening and develop an action plan for intervention that will stimulate and support knowledge creation.

In the 'Knowledge Supply' phase, members of the community primarily collaborate in a one-way pattern of communication, i.e., from the subject matter experts (SME) or experienced users (EU) to the users in need (**Fig. 9**). Community members are seeking existing experience. During this stage, the community has not yet developed a significant level of mutual trust among its individual members; it is more of a generalized reciprocity. Members are willing to ask questions because they trust someone in the community, who they may not know, will help them. When members get the help they need from the community, they feel indebted, not necessarily to specific individuals, but to the community as a whole.

Figure 9

In contrast, as the community matures, e.g., the Knowledge Demand phase (**Fig. 10**), members begin to recognize each other in collaboration activity and develop a greater level of trust with individual community members, an individualized reciprocity. Members will help other members with whom they are familiar
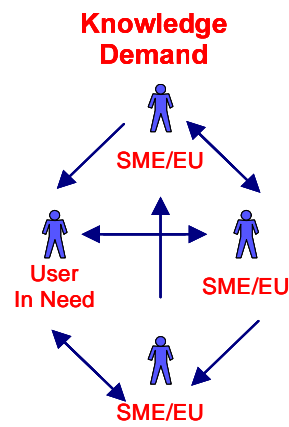
Knowledge
Demand

SME/EU

User
In Need

SME/EU

SME/EU

Figure 10

because they recognize that at some point they too will require help and know they can rely on those people that they have helped in the past. At this stage, people also begin to build on each other's ideas. Although there may not be an immediate answer to the posted problem, those with thoughts on how to solve it begin to leverage the ideas developed during online conversations. When a community reaches this stage, organizations see big improvements as knowledge creation and faster adoption of solutions occur. This community activity fosters innovation and new product development. The quest now is to move to the knowledge creation phase as quickly as possible, without short-circuiting the development of the necessary trust required for this mature phase.

SUSTAINABILITY

What started as a hypothesis for sustainability almost four years ago is proven every day as nineteen communities continue to thrive [4]. This organization has built in key elements to its knowledge management systems and processes that not only support the development and launch of new communities but provide a strong foundation for continuity.

Each of the 19 communities was built with a primary focus on the needs of the business. A well-documented business model sets forth the vision, objectives, design features, measurable goals, and resources required for the communities. The business model also helps ensure sponsorship from the business owner.

The KM communities improve quality and productivity in the workplace by focusing on answers and solutions to problems that help people in their daily work. As part of this process, it is very important to define meaningful metrics that can track success or failure.

The active participation of a full-time knowledge broker is an important aspect of the community system as well as a critical factor for sustainability and a key ingredient for success [5].

ADDITIONAL OBSERVATIONS

In late 2004, we conducted a survey of all communities and collected data from 576 participating community members. We extracted the number of issues initiated or posted per member as well as the number of threads or comments added to an issue per user. The data were sorted in various ways, e.g., by age (**Fig. 11**), to learn more about our community members.

The youngest age group (< 31 years) initiated the largest number of issues per user, followed by the oldest group (> 50 years. As might be expected, the postings of the youngest (typically the least experienced) workers were primarily questions or requests for information, while most of the issues posted by the older (experienced) group consisted of good practices or lessons learned, i.e., knowledge that they had acquired and wished to share with the community. This result is supported by analysis of the number of threads added per user. The over-50 group is the most active (Fig. 11), i.e., the more experienced seek to ensure that good practices and lessons learned are spread throughout the entire community.
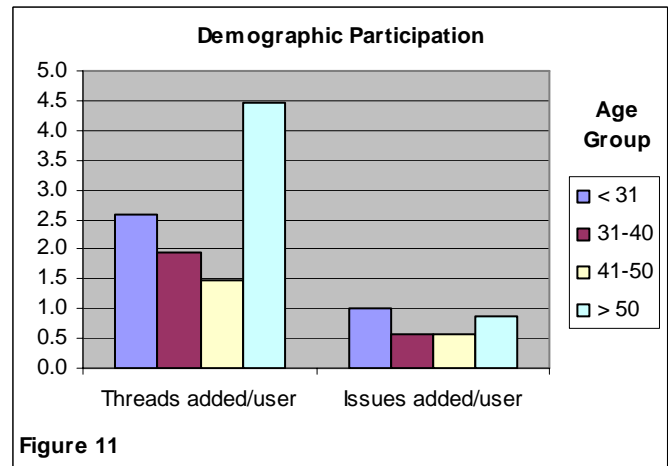

Figure 11

Surprisingly, data showing access by age group shows very little difference in the number of issues read per user or the number of days accessed per user across all of the age groups (**Fig. 12**).
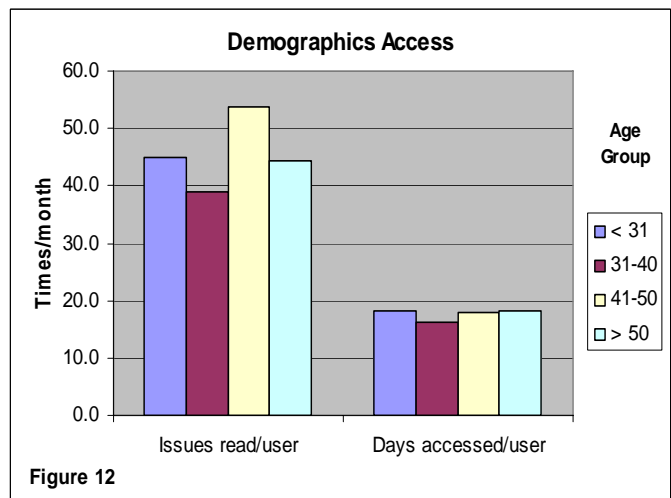

Figure 12

OVERALL RESULTS

Between 1981 and 1993 the Total Recordable Injuries (TRI) statistics for this organization consistently tracked the worldwide drilling rig count. (**Fig. 13**)

In 1993, 'Project GO' consolidated 10 independent service companies. At this point in time, there was also a significant increase in TRI. In 1996, the Performance Improvement Initiatives (PII) were initiated to improve the health, safety, environment and service quality of the company. Figure 13 shows a steady decline of the TRI between 1996 and 1999. This trend continued during 1999-2001, despite a concurrent increase in the rig count beginning in that year. A further decline in the

TRI, began in 2001, despite an increasing rig count, after the KM initiative was implemented. We believe that the PII and KM initiatives helped develop and maintain a learning attitude among employees that has translated into the safety improvements shown in Figure 13.
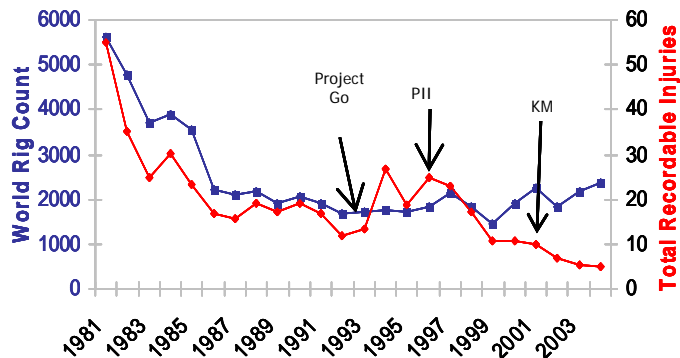

Figure 13

Additionally our company tracks customer satisfaction. At the end of every job, customers are asked to rate performance from several perspectives ― health, safety, environment, equipment, personnel, timeliness, materials, and overall job satisfaction. Performance is rated on a scale of 1 (unacceptable) to 5 (outstanding). Jobs receiving ratings of 1 or 2 or with negative comments are in the customer dissatisfaction category (**Fig. 14**, red).

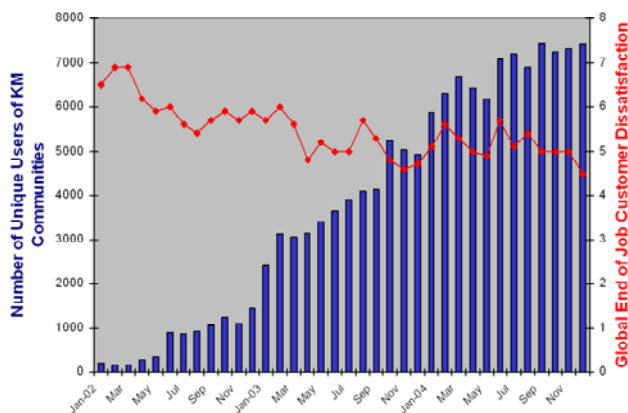When the company initiated the KM community system, we

Figure 14

wanted to know the impact that KM had on customer dissatisfaction. Figure 14 shows that from January 2002, when the first KM communities were launched, through December 2004, there is a visual correlation between the number of employees participating in communities and the decrease in customer dissatisfaction.

In November 2004, a survey of the KM communities confirmed our belief that KM was instrumental in achieving these improvements. The survey was sent to 1,020 people of the 7,000 then participating in the various communities, with a 57% return rate. The following are highlights of the survey results:

- 87% believed they gained valuable knowledge they can apply to their job by going to the collaboration tool on the

community portals.

- When asked 'How many hours per week do you estimate the community portals save you?' The response was averaged at 3.2 hours per user per week.

- 78% indicated that individuals around them have benefited from the knowledge they have gained from the community.

- 73% indicated that when they experience a problem at work, they could count on the community for help.

- When asked whether access to the knowledge and experience of experts has improved, 81% responded yes.

- 76% believe that the communities have given the organization a competitive advantage.

- 87% believe that participation in communities has a positive impact on service quality for their respective business unit.

- When asked 'How would you rate the quality of the solutions generated through community collaboration?' 98% responded acceptable or better.

From 2002 to 2004, the company recorded $69 million in business value from 19 communities of practice with an ROI of 369%. Currently there are 8,000 employees voluntarily participating in over 80 countries.

CONCLUSIONS

We believe that the power of networks is crucial to the future of our organization. From the start, we have built a knowledge management system with this belief in mind. Feedback from our communities validates the conclusion that people participate in communities because they derive value by doing so. We use this feedback, as well as business performance measures and community activity measures, to gauge how well the communities are strengthening both organizational performance and individual learning and performance.

Our survey responses show that people participate in KM communities because of the speed with which they receive replies, the quality of the responses, and the variety in points of view. Additional benefits from frequent participation in KM communities include expansion of one's professional network, enhanced knowledge of a particular discipline, and peer recognition for valuable participation. These benefits are important elements of the individual's professional development.

The assertion that people in our organization participate in these communities is documented by the fact the average adoption rate for a community in the first 30 days is 50% of the expected population..

Some of the evidence we have presented here is primarily from surveys and testimonials. While that evidence alone would indicate that our communities are helping people as they perform their jobs, existing measures around productivity, revenue, cost savings, and satisfaction corroborate the impact KM and our communities have on our company's success.

We believe that networks and communities play a paramount role in sustainable innovation as a competitive driving force. As we continue to develop and support our communities, our challenge is to learn more about nurturing and cultivating an

environment most beneficial for innovation.

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