



Expanding the field of vision

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Abstract

Purpose – The purpose of this article is to describe the emerging business discipline of organizational network analysis and its potential as a tool to guide efforts in creating awareness of where knowledge exists in an organization and how this expertise can be best tapped by an organization's workforce. Specific initiatives and activities that companies are using to promote the changes necessary to ensure that knowledge flows are discussed.

Design/methodology/approach – The article gives a case example of building a networked organization at MWH Consulting, Broomfield, Colorado, USA.

Findings – When organizational network analysis is accompanied by management practices that encourage, support, and require connectivity, employees more naturally leverage the expertise of peers and counterparts, wherever they live.

Originality/value – The article provides an insight into organizational network analysis and shows the barriers to and signifies the importance of knowledge management.

Keywords Knowledge sharing, Knowledge management, Information management, Skills

Paper type Research paper

1. Introduction

Knowledge flows along existing pathways in organizations. If we want to understand how to improve the flow of knowledge, we need to understand those pathways (Cohen and Prusak, 2001, p. 60).

It's a global, networked, and increasingly flat world. In his recent book, *The World is Flat*, New York Times journalist Thomas A. Friedman (2005) reports on his research into the collaborative trends that are reshaping the world we live in: outsourcing, off-shoring, open-sourcing, in-sourcing, supply-chaining, and "informing". While Friedman provides a macroeconomic and political perspective of the implications of these trends, he also illuminates for leaders the business importance of collaboration – inside and outside the firm. The pressure to collaborate internally has been growing steadily since the early 1990s with the impact of internal restructuring, downsizing, globalization and general shift in the economy toward knowledge based work. Unfortunately, despite a plethora of technical solutions, many CEOs still feel the pain of seeing work replicated in different geographies and business units because people are just not aware of what others are doing.

This "first generation" of knowledge management reflected the urge to identify, collect, categorize and make accessible the "knowledge" of the organization as represented by artifacts such as "best practices" in knowledge bases, intranet portals,



content management systems and (more slowly, but increasingly) collaboration software. All of these efforts are directed at making it possible for employees to share knowledge. The second generation of knowledge management reflected the realization that technology wasn't the answer, but merely an enabling infrastructure. Attention shifted to the identification and transfer of tacit knowledge as the problem shifted to understanding the impediments not just to locating and sharing knowledge, but to the engagement of individuals and teams in joint learning through problem-solving, task execution, and generative thinking. A study by Szulanski (1996) commissioned by the APQC looked at the practical barriers to effective knowledge transfer. His findings concluded that there were three significant barriers:

- (1) *Ignorance*. Companies and individuals on either side of a transfer of knowledge did not know that each other had or was looking for knowledge.
- (2) *Absorptive capacity*. Even when managers knew that a better practice was available, they did not always have the time or resources to implement it.
- (3) *Lack of relationship between the source and the recipient*. People just didn't feel comfortable going to ask complex questions of people that they did not already know.

This article describes the emerging business discipline of organizational network analysis and its potential as a tool to guide efforts in creating awareness of where knowledge exists in an organization and how this expertise can be best tapped by an organization's workforce. We then describe specific initiatives and activities that companies are using to promote the changes necessary to ensure that knowledge flows. We put the emerging research and learning about ONA and network-building practices in the context of the real-life story of MWH, a global engineering consulting firm that is a leader in the areas of water, hydropower, and remediation.

2. From SNA to ONA

A key current trend in knowledge management is the focus on the importance of relationships in effecting knowledge sharing. Organizational network analysis (ONA) has become the standard method for diagnosing the relationships among individuals and groups inside firms and across organizational boundaries. ONA leverages decades of work in the social sciences discipline of social network analysis (SNA), the study of the relationships and roles between people, groups, and organizations. In a business context, the techniques and methods of SNA have been adapted and refined to applications seeking to understand the role of relationships in organization and hence is more specifically called ONA.

ONA begins with a survey or other data-collection method or instrument. In a survey, the ONA requests that individuals in an organization answer a series of questions about their relationships with others in that organization, or "network". The questions reveal different aspects of the relationship – frequently of information exchange, for example, or likelihood of seeking a person out for problem-solving or decision-making. Each question represents an aspect of the network. The network map shown in Figure 1 represents responses of "agree" to the statement: "I understand this person's knowledge and skills."

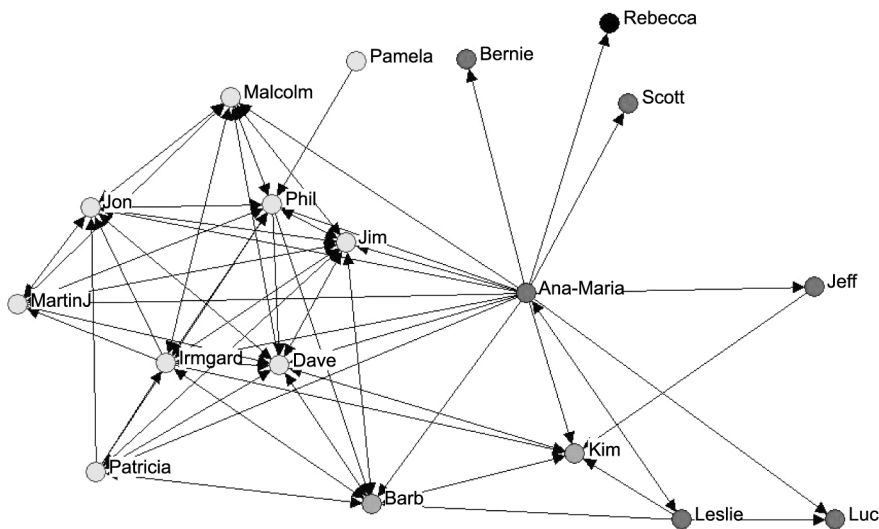


Figure 1.
How well do you know
what others know?

An arrow represents the directionality of the assertion. Hence, Ana-Maria asserts that she understands what almost all the others in this network know. But only one person, Leslie, is familiar with Ana-Maria's skills and experience. The networks produced from the responses to this question are most commonly called the "awareness" network.

Initial research by Cross *et al.* (2001) included this awareness question from Figure 1 in a set of four questions that go to the heart of an organization's capacity to share knowledge, particularly the type of knowledge that is difficult to absorb through reading and research. The relational dimensions expressed by the four questions are:

- (1) *Knowledge of what others know.* This dimension speaks directly to Szulanski's first factor, ignorance. For there to be any transfer of knowledge there must first be the awareness that the knowledge exists somewhere in the organization.
- (2) *Access.* It is not enough to know what others know, there must be a way to access to their thinking in a timely fashion. The ability to reach others is shaped by organizational structure, physical proximity, and technology use.
- (3) *Engagement.* For knowledge that is transferred through dialogue and personal interaction, the person who holds the knowledge must be willing and able to engage in that type of knowledge transfer and shape what they know to the evolving needs of a knowledge seeker.
- (4) *Safety.* Given awareness of what others know, access to them, and the ability to engage, the quality of the potential knowledge transfer rests with the issue of the quality of the relationship. In a "safe" relationship, people are able to admit a lack of knowledge and also to engage in divergent thinking. This safety characteristic is sometimes expressed a bit differently, as the cost of a transaction.

What Cross *et al.* found, and what subsequent research has further affirmed (Cross and Parker, 2004; Cross *et al.*, 2002), is that the dimensions of “knowing what others know” coupled with “ability to access others” are important predictors of individual performance and by inference, overall organizational performance. ONA has become an important tool in the leadership toolkit because it addresses these and other issues of the social and relational aspects of work. As a diagnostic it provides insights into the existing patterns of relationships and enables leaders to allocate budget and (the most critical resource) attention to the points where intervention will have the largest payback.

3. Time to connectivity: net work practices to improve awareness and accessibility

We can use ONA on these relational dimensions to pinpoint more precisely where we want to initiate connectivity. Rather than the traditional “more is better” assumption that most technologies or cultural interventions take to collaboration, ONA provides more targeted and ultimately more successful interventions. Once opportunity points are identified, initiatives and activities to promote greater awareness of the knowledge and skills in an organization range from the blindingly simple to the strategically transformational.

3.1 Blindingly simple

Two of the authors once facilitated the review of an ONA of an executive team in a professional services organization. Not atypical for this type of organization, the groups under the senior practice managers were not looking to each other for assistance in solving problems or creating joint business. This “silo-d” aspect of the organization was having a serious impact on revenues. In our dialogue with these managers, they became aware that they had not actually cross-presented and reviewed their individual strategies (including technology and knowledge maps) with one another’s staffs. They simply did not know what each others’ groups were doing.

Communications provide a key role in ensuring that awareness of knowledge and work crosses organizational boundaries. Newsletters, internal conferences and symposia, active intranet portals, brown bag lunches are historically proven ways to create and maintain awareness and should not be overlooked in any rush to promote technology as the “answer”.

3.2 Strategically transformational

At the other end of the spectrum, companies that decide to develop collaboration as a core competency will invest millions of dollars in the introduction of enterprise software that manages skill and experience profiles and facilitates connections between and among people and content. These large and complex interventions include software like Tacit Systems EKG profiling systems. Software that is integrated with corporate email and document management systems can provide the context for people who seek knowledge to quickly find people who have the knowledge either by directly searching for a contact based on a skill, or through reading and reviewing artifacts in the company’s knowledge management system.

3.3 *Incrementally manageable*

Knowledge of what others know in an organization is often tied up with the other key aspect, accessibility. It's generally true that people who work on the same floor, use the same cafeterias, and attend the same meetings have the proximity enabler. Proximity is particularly useful for those serendipitous encounters that spark ideas, get decisions made, and answer the burning question of the moment. In global virtual environments, technology is the vital enabler, but it has to be introduced carefully to grow into the culture. Instant messaging is an excellent tool to simulate the loss of physical proximity for teams that are widely distributed. In most collaboration systems, instant messaging is integrated with a team's work space so an employee can not only tell whether another person is "online" but also whether their attention is directed to their common workspace at the moment.

Regardless of the approach to organizational change, all ONA projects use a common methodology which consists of identifying the business problem; designing an ONA; interpreting the results; crafting and implementing appropriate interventions, and following up. Our case example below illustrates these steps in a real-world example.

4. Building a networked organization at MWH Consulting

4.1 *Introduction*

MWH is a global leader in the areas of water, hydropower, and remediation. In 2003, the organization realized more than \$975 million in revenue and had over 6,000 specialists in more than 36 countries. MWH service lines included environmental engineering, power generation, facilities development, construction, multi-sector program management, asset management, government relations, and applied science. These services were provided to a wide array of institutions, including municipalities, government agencies, multinational companies, industrial concerns, and military organizations worldwide. A \$3.3 billion capital improvement program to expand the water and wastewater infrastructure serving 7 million residential and 200,000 business customers is not an atypical project.

In the fall of 2003, the IT group of MWH Global realized that its regionally-based organization could not meet the demands of the company for standard technologies, consistent levels of services to end users, and for reusable methods to support the IT-based services it delivered to MWH's customers. Figure 2 illustrates the old and new organization charts.

The reorganized structure had some of the following key elements:

- The new Global Services unit centralized support and services for key technology areas (messaging, networks, and so on), that had previously been run independently in each of the regions (Americas, Europe, and Asia).
- Regional directors, who had previously been responsible for all these individual operations were now more focused on the negotiation of services for the region and the people management of the staff in the regions.

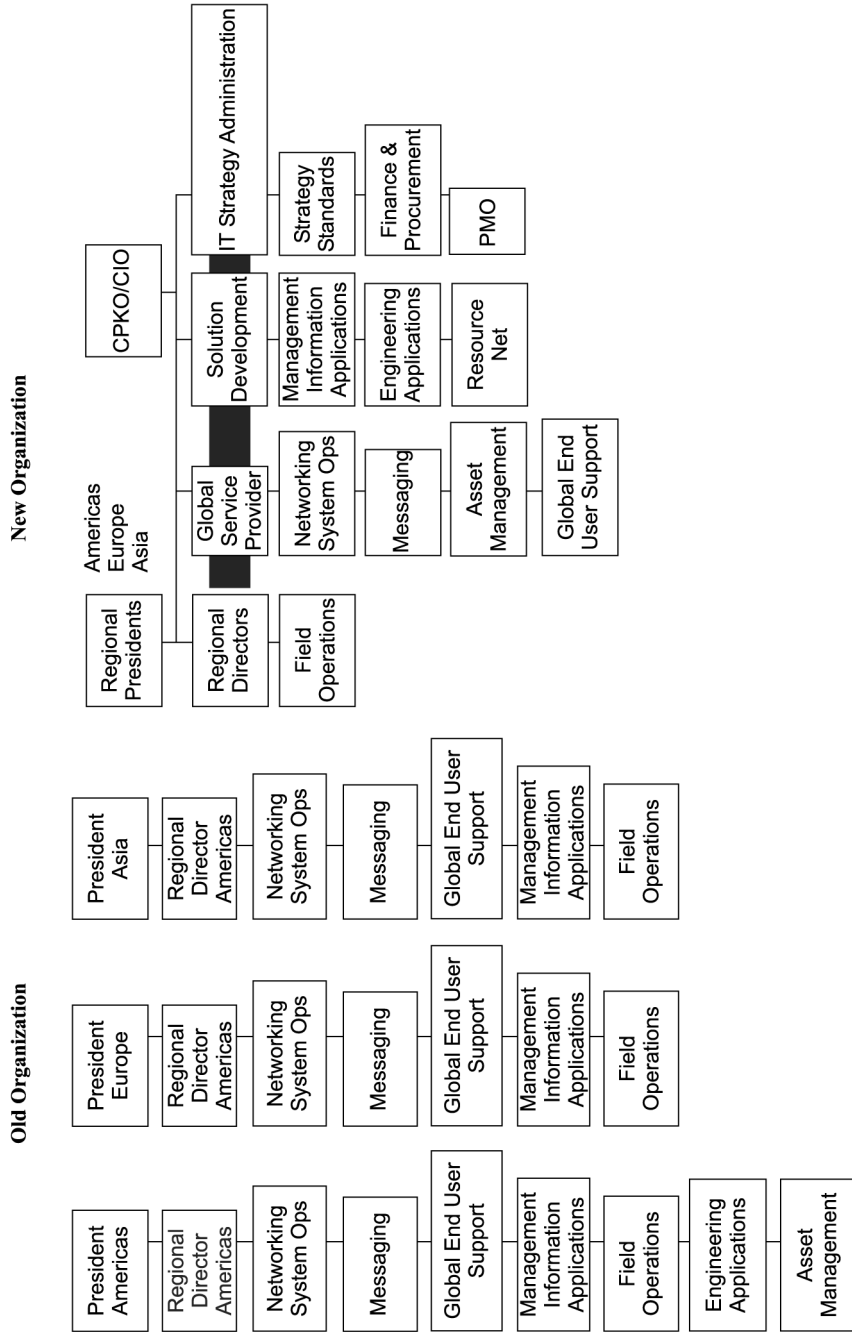


Figure 2.
Old and new organization
charts for MWH's IT
organization

- A central group for IT strategy and administration was created to monitor compliance with project management methodologies, finance, IT standards, and strategy implementation.
- The establishment of expertise groups charged with cultivating and maintaining expertise in technical areas critical to MWH, including a key expertise group in a program management office (PMO) for program and project management methodology.

At the time of this reorganization, iNet consisted of 185 people in 27 offices in 11 countries. The culture was known to be highly relationship-based, such that its staff had developed working partnerships with individuals from the business units that they supported.

Clearly, this kind of reorganization was bound to disrupt existing organizational networks. Managers would need to understand the implications of those disruptions as well as the best places to focus on building new relationships. Vic Gulas, MWH's Chief Knowledge Officer (CKO) and CIO knew that ONA was the right tool to obtain a snapshot of existing relationships in the organization and from there to:

- create a visual representation of the organization to use in the change management process;
- to spark dialogue among managers promoted or assigned to key positions so they could understand the structure of the networks they would need to build; and
- establish a baseline of connectivity against which changes and improvements over time could be measured.

To refine the baseline, Gulas collected demographic information about the people in the organization so that he could view the relationship maps from the perspectives of:

- business group;
- geography;
- membership in expertise groups; and
- level in hierarchy.

In addition to the awareness question, the MWH survey also drew responses to the following: "Please indicate the extent to which the people listed below provide you with information you use to accomplish your work." This is the "information network" question.

The first network analysis of the awareness network for iNet is shown in Figure 3. As you can see, network maps for an organization of this size can be very difficult to read. So while the overall snapshot can elicit a gestalt response (especially when different groups or geographies are highlighted showing nodes in different colors), mathematical representations of the data are much better for the purposes of comparisons and benchmarking. For example, Gulas felt that iNet employees would reach out to a friend for information and possibly turn to a friend of a friend (two steps in the information seeking process); however, moving beyond two steps substantially

decreased the likelihood that employees would get the information they needed, or that the people they sought out would respond in a helpful fashion. In network metric terms, there is a calculated value associated with the number of steps (also referred to as the “degrees of separation”) on average each person is from everyone else. The data from this survey indicated that each person in the network was 2.1 steps away from every other iNet employee, not quite the 2 steps he had been looking for.

Another critical metric that ONA practitioners rely on to show changes in networks over time is density. The density of a network represents the percentage of ties (relationships) that exist at a particular response rate out of the total possible that could exist. These calculations are built into the analysis software in a way that will reflect the overall density of the network as well as the density of relationships between two groups.

4.2. Leading in a connected (and complex) world

An ONA rarely points to a single, major intervention, a silver bullet that will automatically recharge the organization into a collaborative, trusting global entity. From the potentially very large number of metrics that can be drawn from a single ONA, a manager needs to focus on those that present the most compelling opportunities for change. For Gulas, the significant themes that emerged from this ONA were:

- expertise groups were not well connected across geographies;
- many groups relied on overly central people who were becoming bottlenecks; and
- connectivity was relatively serendipitous.

One real eye-opener is shown in Figure 4, which illustrates the network of information flow. In this map, notice the connectivity of the group in Pasadena California (circled). This group was tightly interconnected, but less well connected to other parts of MWH, including Europe and Asia!

After the IT management team reviewed the data, they understood the scope of the overall challenge to connectivity, an orchestrated set of activities to improve the connectivity began:

- Extensive communication efforts. Vic used the results of the ONA in team meetings around the globe, highlighting the urgency for increasing collaboration with the evidence from the charts.
- Creation of knowledge bases in primary expertise areas. MWH managers are focused on establishing communities of interest and embedding participation in the development of knowledge bases as an aspect of job performance.
- Coaching for management team. Each manager reviewed their own positions in the ONA and used these insights in planning their strategies. For example, the manager responsible for the networks and servers group understood the importance of connectedness across this expertise area; he worked to ensure that people started to think “outside their own region”.
- Development of cross-functional teams. The manager of the project management group faced the challenge of establishing common practices across the regions.

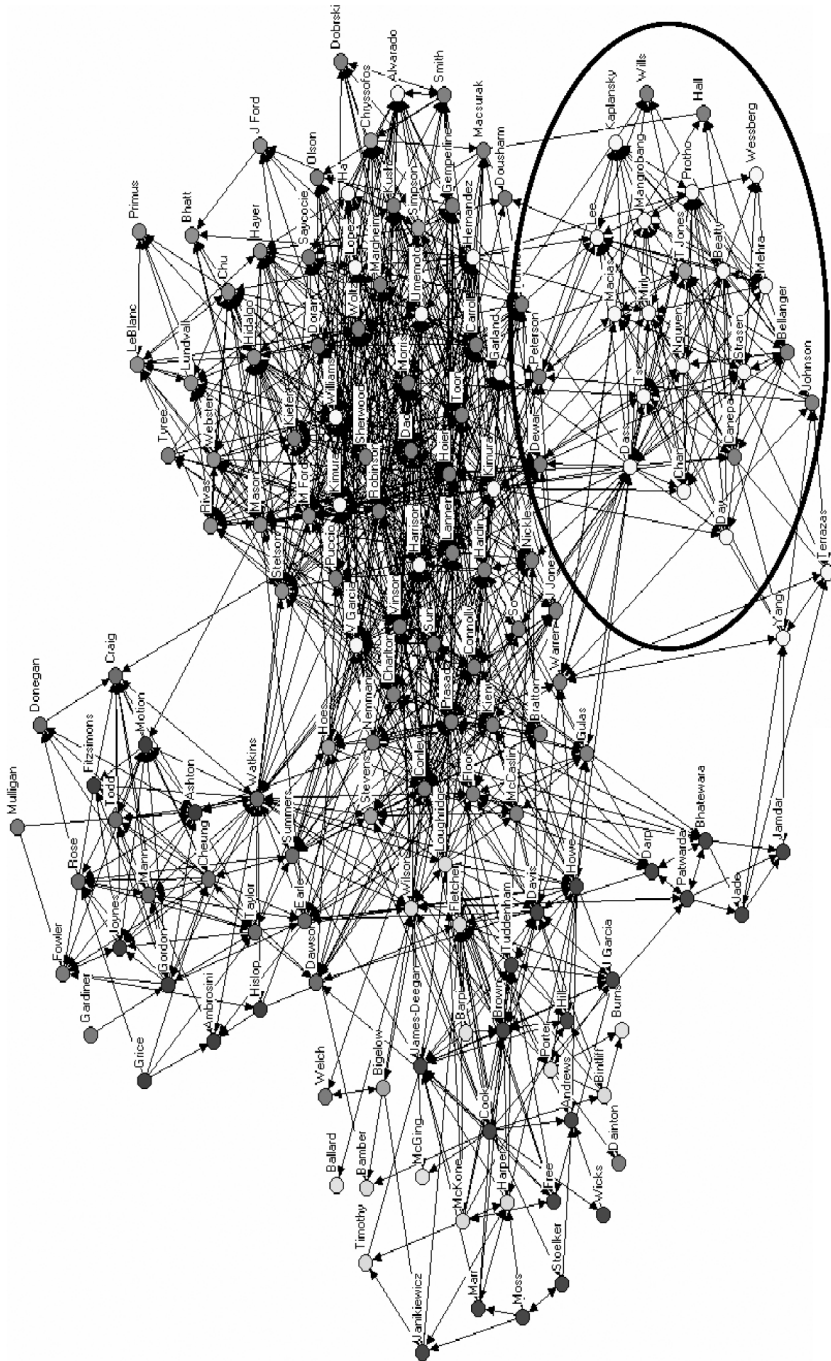


Figure 4.
Information flow across
locations and geographies

He deliberately pulled in constituencies from across the regions to participate in the design of a global project management framework.

- Increased travel to facilitate more face-to-face meetings.

Communication was the key focus during the first year of the change effort. This included:

- Team-building meetings. Staff from across the regions were brought together to participate in planning the expertise groups, program and project management efforts, and the launch of key initiatives.
- Continuous reinforcement of messages by senior management about the need to work across geographies and to staff teams based on expertise, not proximity. “We are not regional anymore.”
- Expansion of communications across the group from a standard newsletter to a collation of fortnightly status reports circulated to the entire line management team.

Interviews with four key managers confirmed that the consistency of the messages and communications coupled with increased opportunities to meet with their counterparts in other geographies face-to-face were the most significant interventions for creating awareness that led to actual collaborative work. As one US-based manager put it@ “Having met people, you know what people know about... their skill sets come through in face-to-face conversations and in working together on projects.”

A manager responsible for the creation and maintenance of a global framework for project management echoed her comment, “You cannot manage virtually until you know the people you manage,” he said, but way of acknowledging the power of the face-to-face meetings. Until this reorganization, MWH had not invested in travel for its staff. Everyone interviewed pointed to this single intervention as one of the most key in building awareness.

Acting on awareness – really pulling people into collaboration – was emphasized in management communications. The manager responsible for the program management office (PMO) said, “We are a global organization and have a clear directive of the need to be global.” He also pointed to the work required to develop global processes; he emphasized that although the PMO was responsible for the framework for project management it would not work if the PMO “owned” the framework. He and the PMO staff have created a collaborative global process for reviewing the framework, collecting lessons learned, and coaching each other on high-risk projects. What works? “Staying on message,” he says. The fourth manager interviewed summarized his role as “facilitator and interpreter”, bridging the work of the local field staff in his geography with global processes and work teams. He is also very sensitive to issues of personal connectivity highlighted by the ONA. Sometimes a lack of connection can indicate a relationship that needs to be developed or repaired and he takes the time to work on these “quietly in the background”.

4.3. Measuring the results

Developing collaborative habits and organizational connectivity is an ongoing process. How do you know when the actions you’ve taken are working? Measurement needs to

reflect both qualitative assessments and concrete data. Qualitative information comes from direct observation and experience, interviews, and employee surveys. In this case, we used interviews with managers whose positions required them to work at establishing connectivity. Their observations:

- “Two years ago, trust, even in the US, was ‘almost none’ even within the same building. Now we work together on projects and are consulted earlier in projects, rather than being treated as a service provider.”
- “I see folks teaming up with people from other groups and see representatives from all groups when a project is presented.”

To obtain quantitative data can require a second ONA. MWH conducted eight months after the first one provided quantitative data to back up the qualitative assessments. The density in the awareness network increased three percentage points and the distance (average number of steps) was reduced from 2.1 to 1.9. More significant were the changes in density across the individual expertise groups, as shown in Table I.

Positive increases reflect those areas where organizational design and collaboration have taken root as to “how we work”. Decreases in connectivity highlight areas of concern; in the case of the end user support group’s decrease from 25 percent to 12 percent, the drop is indicative of major turmoil and organizational change within that group not related to ONA interventions. Metrics such as these are now in place as a regular part of MWH’s organizational assessment process as it continues its program to be a globally connected organization.

5. Summary

A network analysis of an organization – particularly in conjunction with a major organizational change – provides both insight and meaningful metrics that map to individual and group performance. In particular, the changes seen in the awareness network at MWH Global signify the importance of people knowing what each other knows. True learning occurs in the transfer and creation of knowledge among individuals, but this learning cannot occur if people are unaware of the skills of the people around the world or even across the hall. Further, the MWH experience has also shown that the lack of social relationships, that is a barrier to learning as evidenced in Szulanski’s research (Szulanski, 1996), is an element that the organization has the ability not only to change, but also to measure.

	2003 (%)	2004 (%)
Networks/servers	19	26
Messaging and collaboration	31	44
Application support/development	8	11
End user support (help desk)	25	12
Field operations	9	10
Telecommunications	17	50
Project management	10	13
Other	20	23

Table I.
Network changes over time

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