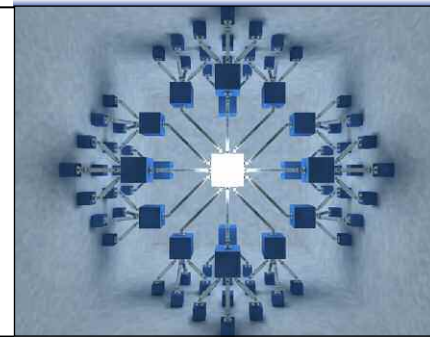


Managing the 21st Century Organization

By Valdis Krebs, orgnet.com



IF KNOWLEDGE IS POWER, WHAT IS CONNECTED KNOWLEDGE?

Our knowledge economy operates on the complexities of connections. All individuals, teams, communities, systems, and other business assets are massively interconnected in an evolving economic ecosystem. In the connected economy, each network actor is embedded in a larger economic web that affects each participant and, in return, is influenced by that participant. In such a connected system we can no longer focus on the performance of individual actors – we must focus on system outcomes. The key is performance of the connected whole.

Efforts at making sense of this new world are beginning to reveal some basic principles at work in the complex adaptive systems we call our organizations.

*“There is a central difference between the old and new economies:
the old industrial economy was driven by economies of scale;
the new information economy is driven by the economics of networks...”*

– Carl Shapiro and Hal R. Varian. *Information Rules*. 1998.

Recent research on productivity and effectiveness in the knowledge economy provides insight into what works in the connected workplace. Certain patterns of connections appear around both effective individuals and successful teams when performing knowledge work.

ORGANIZATIONS: OLD VERSUS NEW

When change was slow, a tall hierarchy with segmented knowledge was the organizational structure of choice. This model was developed in the mid-1800s to run the railroads and worked very well to get the trains on time with minimum accidents. This model worked well for 100 years until the economy saw the influx of computers, copious amounts of data, and rapid information flows. Figure 1 shows the hierarchy of an IT department. The CIO is at the top, the directors are at the next level down and report to the CIO, and finally the managers are the bottom rows reporting to the directors. No one beneath the level of manager is shown on the chart. For privacy reasons, the actual names of the employees are hidden and replaced by numbers.

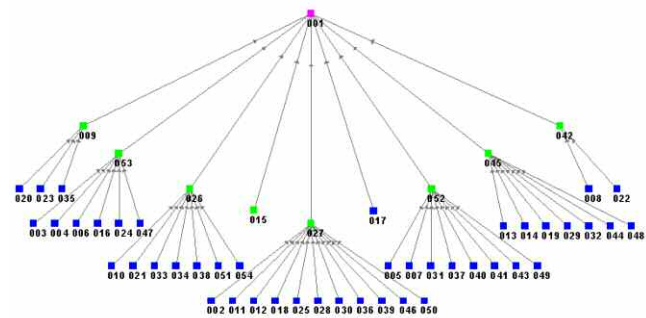


Figure 1. Hierarchy of the Traditional IT Department.

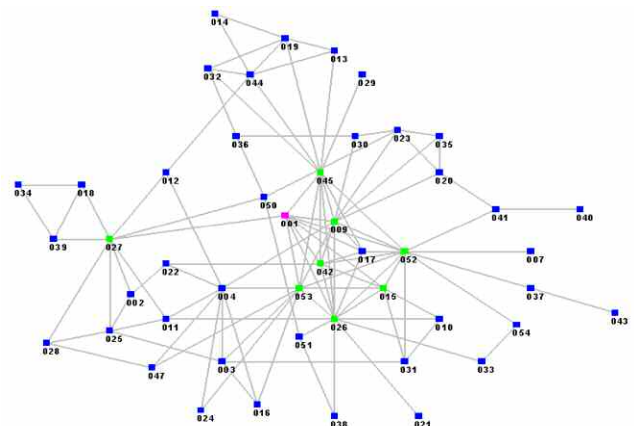


Figure 2. How Work Actually Gets Done in the IT Department.

In hierarchies, everyone is linked to a boss above them. Groups are not connected to each other except through a common boss. Going outside the formal lines of communication and authority is usually frowned upon in rigid hierarchies.

In the knowledge economy, the organization structure has changed. The hierarchy is *not* gone. It still represents the authority structure and the division of functional responsibility. The hierarchy of old now shares the organization structure with emergent networks that respond to dynamic environments. A new structure – representing information flow and knowledge sharing – reveals how things really get done in the information age. This new structure is based on data gathered from employees via a survey.

How things get done is an overlay upon the formal structure of the hierarchy – it is not a substitute. Figure 2 shows the exact same organization as Figure 1, except this diagram links together the nodes that actually work together to accomplish the organization's goals. No longer is the top of the diagram a better location than the bottom of the diagram as in Figure 1. Old hierarchical segmentations disappear in this boundaryless view of the organization in Figure 2.

INSIDE THE ORGANIZATION: INDIVIDUALS

Human capital is the latest trend in human resources. Is it the key to effective employees? Is it what you know (*human capital*) or who you know (*social capital*) that leads to success? This has been often debated with good arguments on both sides. Most managers today would side with the “what you know” crowd.

In the late 1980s, management researchers were starting to notice that some managers were better than other managers at accomplishing objectives through relationships. John Kotter of the Harvard Business School discovered that effective general managers spend more than 80 percent of their time interacting with others. Other management scholars were also starting to see the importance of conversations and relationships in managerial work. Individual mastery was no longer the key – it was *human capital and social capital working together to create productivity and innovation*.

Ron Burt of the University of Chicago, a leading researcher on the social capital of managers found, through numerous studies, certain patterns of connections that individuals build with others brings them higher pay, earlier promotions, greater influence, better ideas and overall greater career success. Burt believes that good social capital provides a much higher return on investment in human capital – the two work together.

Arent Greve, a researcher at the Norwegian School of Economics, is also interested in the contribution of human and social capital to organizational outcomes and individual productivity. He studied project managers in a knowledge-based services company in Europe. He viewed human capital as the knowledge and skills attained by the individual over his/her career. Social capital was defined as a property of personal networks – the ability to reach others, inside and outside the organization, for information, advice and problem-solving. He found something very interesting. As expected, both human capital and social capital had a positive effect on productivity. Unexpected was the dominant affect of social capital – project managers with the best personal networks were most productive! They were better able to coordinate tasks and find the knowledge necessary to accomplish the goals of their projects.

Figure 3 shows two nodes – the larger ones – that have good social capital in the project network. Both nodes quickly reach out into all parts of the project. Between the two they are aware of what is happening in every corner of the project.

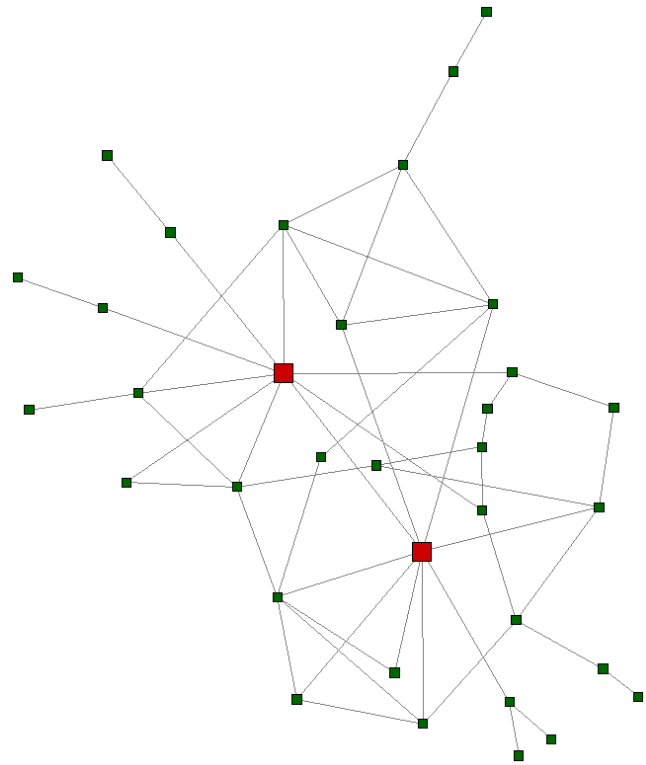


Figure 3. Two Nodes with Good Social Capital.

A great part of today's workforce in many companies is from the “baby boom” generation – a group that is rapidly reaching retirement age. Much of an organization's expertise is located in these experienced employees. Are they critical in accomplishing your organization's goals? Are they the “go-to” people for advice, knowledge, opinions and mentoring? An organization's knowledge sharing and learning are often informal processes dependent upon social ties for transmission. What you know often depends on who you know. Having contacts that mentor you and pass you good advice and knowledge are key to career success. This is social capital in action.

Figure 4 shows a research lab. The links are directional and show who goes to whom for expertise and advice. The nodes vary in size based on how close the employees are to retirement age. The larger the node, the closer they are to retirement.

Once we map the “go-to” network, we can measure it also. Based on the pattern of links – who goes to whom for advice and expertise – we can measure this network in a way similar to how Google measures the Web. We can determine who the key people are in the flow of expertise around this research lab. Luckily, the top two experts are not near retirement, but others in the top 10 are. The three largest nodes and one of the medium nodes are in the top-10 of expertise dissemination in this network. Seeing this diagram, the lab manager immediately started to plan how she would disseminate the knowledge and expertise of the upcoming retirees. She chose mentoring as a first step.

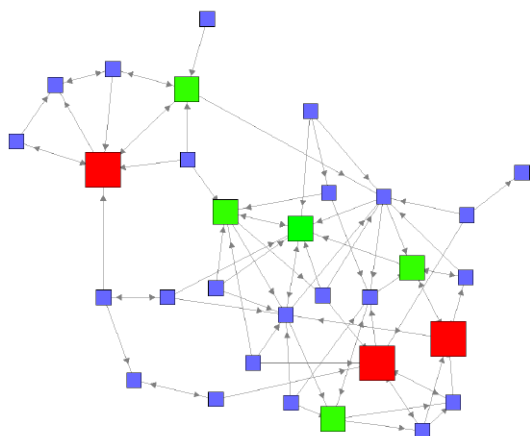


Figure 4. A Research Lab Showing Connections Close to Retirement.

INSIDE THE ORGANIZATION: TEAMS

Working in a high-tech firm in Silicon Valley, Morten Hansen from Stanford University had a similar research agenda to Greve. The key difference was that Hansen was interested in the productivity and effectiveness of teams. Hansen found that teams who could easily reach other teams and access the knowledge they needed were more successful than teams with poor network connections. Both Greve and Hansen found that the ability to reach a diverse set of others in the network through very few links was the key to success for both individuals and teams.

Hansen took his research one step further. He examined the difference between those teams that had many direct connections to other project teams and those that used both direct and indirect ties to reach the resources they needed. Hansen found that those teams that used only direct ties to seek and find information were soon overwhelmed with too many connections! The teams that used the power of the indirect tie, while at the same time limiting their direct ties, were more successful – they did not spend as much time interacting with the network to get what they needed.

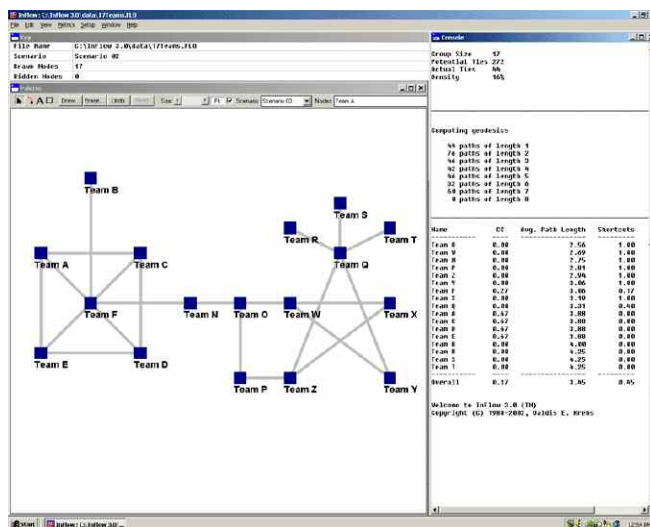


Figure 5. A Network Map of Project Teams.

Figure 5 shows a network map of project teams. A line connecting two teams indicates a two-way information flow or exchange of knowledge.

This network of 17 project teams all work on sub-assemblies to a larger product. The teams are composed of mostly engineers, technicians and project managers. All teams have less than 10 members. Three clusters are evident in the network of project teams.

Before we look at how to improve the overall connectivity of the network, let's digress back to social capital. Which team has the best social capital in this network? Which team can access all of the knowledge and resources in the network quicker than the others? (Hint: this network is drawn to reveal the answer.)

Common wisdom in networks is “the more connections, the better.” This is not always true. What is always true is “the better the connections, the better.” Better connections are those that provide you access to nodes that you currently do not have access to. Although Team F and Team Q have many connections each and have excellent local access (to the nodes near them), they have only fair access to the rest of the network. Team O has the best social capital, aka network benefits, in this network of project teams. Team O achieves this with only three direct ties – it is connected to others who are well connected. Team O's indirect contacts bring access to information and knowledge not available locally.

The average path length in this network is 3.45, with many paths longer than the network horizon. Even in this small network there are nodes, i.e., teams, which are nearly blind to what is happening in other parts of the network.

In the summer of 1998, writing in the scientific journal *Nature*, a stir of excitement was generated by two mathematicians from Cornell, Steven Strogatz and Duncan Watts. While investigating *small-world networks* (emergent networks with many clusters), they discovered that a few randomly added crosscuts between unconnected clusters would improve, i.e., lower, a network's characteristic path length significantly. The benefits were not just local, but spread throughout the network, and this improvement could be achieved with just a few added ties in the network. Very small adjustments could cause large positive changes – a common dynamic in complex adaptive systems.

Looking back on our project team network in Figure 5, how can we improve the connectivity with just one added link? Which two nodes would you connect to bring everyone in the network closer together?

Although many combinations will increase the access of everyone to everyone else, the greatest measurable effect is when we add a crosscut between Team O and Team F. The average path length drops a whole step! The longest path in the network is reduced from seven steps to four steps. In human networks, the fewer steps in the network path, the quicker information arrives with less distortion.

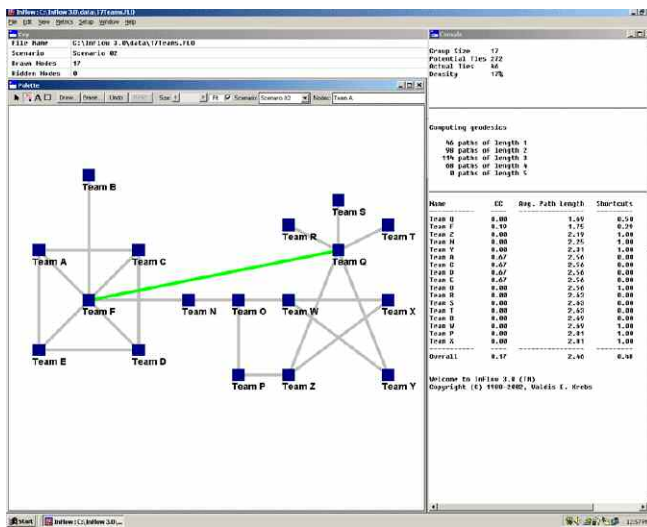


Figure 6. Adding a Crosscut from Team F to Team Q.

The connection between Teams Q and F may be the optimal connection in network efficiency, but it may not be a practical connection. Both of these teams already have many ties and may not have the time and energy to support another one (remember what Hansen discovered about too many direct ties?). What is an alternative connection? If you cannot connect the highly connected nodes, how about connecting their respective network neighbors? Instead of connecting Q and F, how about connecting D and Z? This connection will not reduce the path length as much, but it is between nodes that are not overburdened with connections.

A sparse radial network in which your direct ties are connected to others that you are not connected to, has been shown, by Burt and others, to provide many benefits and opportunities. A diverse radial network, with many unique indirect ties, is appropriate for monitoring what is happening in the organization, and for discovering pockets of knowledge and expertise. Yet, this type of network may not be useful for transferring knowledge. It depends on what type of knowledge needs to be shared. Explicit knowledge, which can be easily codified, can be transferred indirectly through various technologies such as e-mail, FTP, the World Wide Web or documents. For example, sharing a formal presentation, done previously for the same customer, is easy though sharing the context and experience around the presentation may not be so easy. Complex tacit knowledge requires direct interaction and sharing of experiences between two or more individuals. To transfer tacit knowledge, a direct tie with the knowledge source(s) must be established. Trust and understanding must be built between sender and receiver – this is similar to apprenticeship. Explicit knowledge travels over computer networks, but tacit and complex knowledge needs to be shared and learned via human networks.

The organizational network map in Figure 7 shows the e-mail flows amongst a large project team in a Fortune 100 company. It is an X-ray of how the project actually works! Each person on the team is represented by a node. Each

node is colored according to the person's department – red, blue, or green. Yellow nodes are consultants and other specialists hired to work on this project. Grey nodes are not formal team members but are external experts consulted during the project.

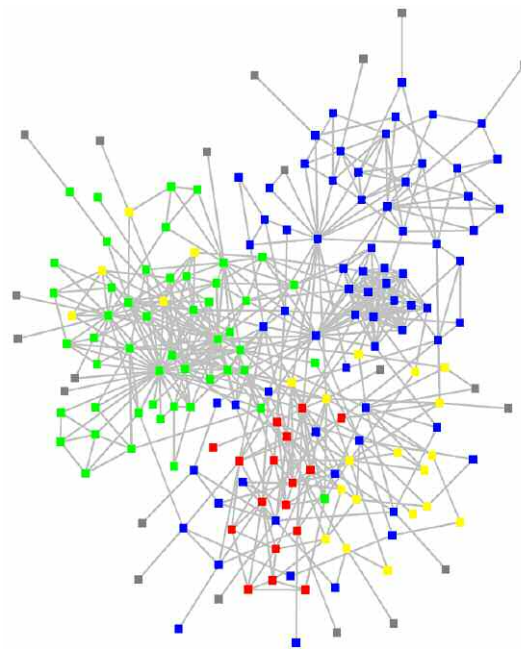


Figure 7. Organizational Network Showing E-Mail Flows.

The client's IT department gathered the e-mail data and provided a snapshot every month of the project. Only information from the *To:* and *From:* fields was used – the *Subject:* line and the actual content of the e-mail were ignored. Only e-mails addressed to individuals were used – those addressed to large distribution lists were disregarded. A grey link is drawn between two nodes if two persons sent e-mail to each other at a weekly or higher frequency.

In addition to the network visualizations, network metrics were generated to see how well the various departments and groups were interacting. Although the project had a formal hierarchy, individual network metrics revealed emergent leadership and expertise throughout the project.

The network mapping began after a key milestone was missed in the fourth month of the project. They continued for the next 11 months. The project leadership reviewed the network maps and metrics each month to monitor the health of the project. No further milestones or deadlines were missed.

The diagram in Figure 7 shows the project network soon after the missed deadline. Notice the clustering around formal departments – blues interacting with blues, greens interacting with greens. Several of the hubs in this network were under-performing and often came across as bottlenecks. Project managers saw the need for more direct integration between the departments. One of the solutions was very simple, yet effective – co-location of more project team members. A surprising solution in the age of the Internet!

Another simple solution was to allow direct interactions between the various technical employees, without going through the various assistant project managers, who ended up being bottlenecks early in the project. These interventions, along with others, improved the information flow, and reduced the communication load on the hubs, whose performance improved later in the project.

INSIDE THE ORGANIZATION: COMMUNITIES AND CLUSTERS

Network ties are distributed unevenly in organizations. People that work together form networks together – clusters emerge around established work relationships. Engineers working on Project X form a cluster, those working on Project Y form a cluster, and those working on Project Z form a cluster. Everyone knows everyone else within the local cluster, and yet only a few individuals have boundary spanning ties to other clusters. Strong, frequent ties are usually found within clusters, while weaker, less frequent ties are found between clusters.

Clusters of concentrated connections appear throughout an organization and throughout industries. Some clusters have many ties outside the group, while other clusters have only a few. Poor connections between clusters result in very long path lengths throughout the organization. In such a network it is easy to access those in your cluster but not those in other clusters. This often results in distant clusters not knowing what information and knowledge is available elsewhere in the organization.

Often, the knowledge you need is in clusters other than your own. Networks have a horizon beyond which it is difficult to see what is happening. Research by Noah Friedkin, at the University of California at Santa Barbara, has shown that this network is approximately two steps in a human network – your direct contacts and their direct contacts. Around three steps out, things are real fuzzy – you do not have a good idea of what is happening in that part of the network. Beyond three steps, you are blind to what is happening in the rest of the network – except for obvious “public” information known by everyone. So the popular idea of it being a “small world” because we are all separated by an average of six degrees is misleading. Six degrees is actually a very large world – one, two and three degrees is a small world! It is usually those separated by two degrees where the “small world” discoveries happen – it is here where you discover the person next to you on the plane is related to a friend from your university days.

In a network of very long path lengths between clusters, your ability to find the knowledge or information you need is very constrained. If the knowledge that you seek is not within your network horizon (one or two steps), then you assume it is not available in your organization and you reinvent it, or pay for it on the outside. Exasperated with the network horizon in his organization, a former CEO of HP once lamented, “If HP only knew what HP knows.”

The natural response in many organizations is to throw technology at the problem. A very poor, yet quite common,

solution is to attempt to *mine* knowledge from employees, codify it, and store it in a large database. Many large consulting firms tried this approach in the 1990s with usually sub-par results. They found that people were not always willing to make public their best knowledge and that codifying tacit knowledge was like trying to nail jelly to the wall. It did not work, and just left a mess.

Why not use the power of the network itself to create a solution? Improve the organizational network and then use technology to help people communicate across wide spans of the human network. At first blush, improving an organization-wide network may seem an overwhelming task. Where do we start? First, look at the networks and communities of practice/interest/knowledge that have organized around a specific topic, product, service or customer. Usually, the whole organization does not have to be included in the problem space. Second, map out the network nodes and their connections (who goes to whom for expertise/knowledge/advice on X?). From this network map, you can see the various clusters and how they are connected.

Figure 8 shows an emergent community of practice at IBM. This was not a prescribed community – it was not formed under direction of management. This community formed over time, and survived over time, based on common interests, knowledge and goals.

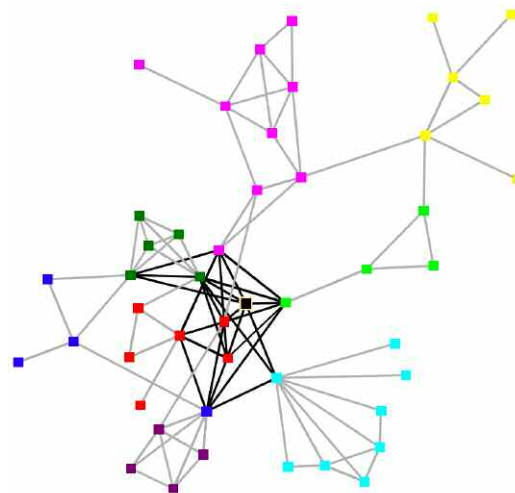


Figure 8. Emergent Community of Practice at IBM.

We were looking for the emergent organization – how work was really done – what the real structure of the organization was. Figure 8 shows us how work was really accomplished in the organization. Two nodes/people are linked if they both confirm that they exchange information and resources to get their jobs done. Each work group involved in the study received a different color node.

The network visualization immediately revealed that there was an emergent cluster of specific professionals in the organization. It appeared to be the key to getting things done. The central members of the community in Figure 8 are connected by the darker links.

One of the benefits of consulting with organizational network analysis is having leading edge clients.

Upon further investigation, we found this central group of professionals had been together for many years, in spite of all the business process re-engineering, down-sizing and merging/consolidation activities that took place at their company during the 1990s. A professional network/community, once established, is hard to break up – even with much manipulation of the formal organization. Thick ties of trust survive both the intended and unintended pushes and pulls of organizational change.

Doctor's use X-rays and CAT scans to diagnose the human body because they are quick, non-invasive procedures that provide good information for diagnosis of a wide range of possible medical conditions. We use social network analysis in a similar way, to scan or X-ray communication networks in a workplace and discover what is really happening inside complex organizations.

LEADING EDGE HR MANAGEMENT

One of the benefits of consulting with organizational network analysis is having leading edge clients. Not only are they open to new methods to improve their organizations, they usually end up teaching me quite a bit. One such client is Vancho Cirovski, vice president of Human Resources at Cardinal Health. Vancho, an expert soccer player and coach, first noticed an interesting phenomenon on the playing field. Teams that were more integrated and communicated well amongst themselves on the field, more often than not, beat a collection of individually superior players who were not interacting well on the field. I saw a similar phenomenon on my son's soccer team. They had good players, but were divided up into two cliques that did not get along with each other – the team as a whole consistently underperformed. On a *team*, it is not the sum total of individual talents, it is the chemistry of the mix that matters!

Vancho saw the same effect in project teams inside organizations. He has summarized these concepts of managing connected organizations using Einstein's famous formula:

E = MC²

- **M** is the *Mastery* of each individual (human capital).
- **C** are the *Connections* that join individuals into a community (social capital).
- **C** is the *Communication* that flows through those Connections.
- **E** is the resulting *Effectiveness* of the team or organization.

Vancho further stipulates that the two Cs, *communication* and *connections*, combine to form another C: *chemistry*, which leads to team or organizational effectiveness.

Teams are not made of talent alone – whether in business or in sports winning teams have something more. It is how the talents of individual players intersect and interact that distinguishes a good team from a collection of good players. From the New England Patriots, to the Detroit Pistons, to the Chicago White Sox – teams without a superstar at every position often win championships.

Vancho believes that team connectivity and communication distinguishes the great teams from the also-rans.

After experiencing success with social network analysis (SNA) in the workplace, Vancho wondered if SNA could be applied equally well to sport. His brother, Sasho, was coaching a Division I NCAA Men's Soccer team – University of Maryland Terrapins – that was struggling. Following a rise to a level of success, the "Terps" were in a "funk," as all teams are bound to be. Could it be they had enough talent, but that the team chemistry was wrong? Sasho was willing to "think outside the box" for a solution.

Vancho and I took an organizational network survey and adapted it to team sports. We divided the questions to cover both *on-field* and *off-the-field* team chemistry. We included questions that would reveal emergent leadership on the team. Vancho gave the adapted survey to the Maryland soccer team and discovered some interesting dynamics, which Coach Sasho immediately put to use. To make a long story short, the year following the network analysis, the team that was rich in talent, now had their chemistry balanced, and the results were obvious. They won the NCAA championship!

A common reason for the failure of many mergers and acquisitions is the failure to properly integrate the two combining organizations and their cultures. Although a formal hierarchy combining the two organizations may be in place, the right work relationships are never formed and the merging organizations remain disconnected. Ralph Polumbo, vice president of Integration for Rubbermaid's 1998 acquisition of its European competitor, Curver, wanted to make sure the two organizations were combining effectively. He decided to map and measure the melding of information flows, work relationships and knowledge exchanges – connections that help cultures combine. His vision was one of a boundaryless organization with no fragmentation along former constituencies. He wanted to track where integration was happening and where it was not occurring. By examining his human and social capital concurrently, he was able to visually monitor the successful integration of both organizations.

Figure 9 shows the initial map of this cross-country merger. The acquiring organization is shown by the red nodes and the acquired organization by the green nodes. Early in the merger, there was a lot of interaction within old boundaries – reds talking to reds, and greens talking to greens. This improved over time as the integration of the two company cultures was monitored and changes were made where necessary. The two cultures were eventually woven together in a successful integration.

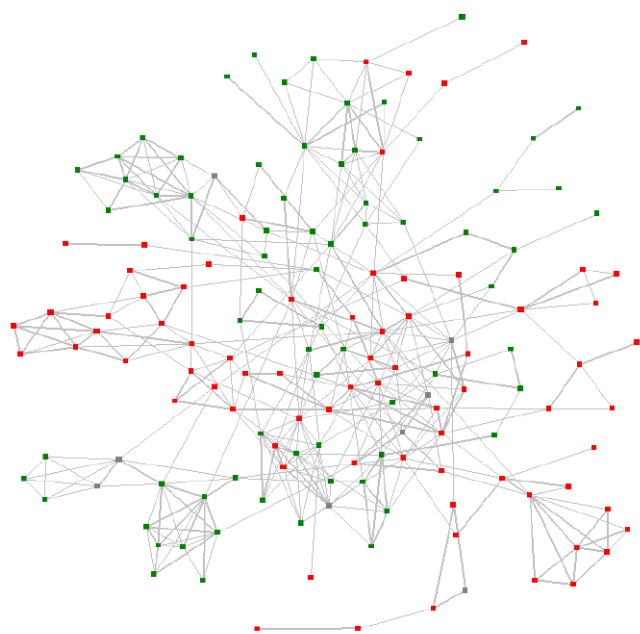


Figure 9. Initial Map of Cross-Country Merger.

ADVICE TO HR IN THE 21ST CENTURY

How can HR managers improve the connectivity within their 21st century organization? Here are a few places to get started:

- Look beyond the individual – uncover their interconnections and multiple group memberships. Who are the linking pins that transfer information and knowledge to key places in the organization?
- Know the difference between tacit and explicit knowledge and how it is shared and transferred. Tacit knowledge travels in human networks, while explicit knowledge can be transferred on computer networks.
- Reward people for directly sharing their know-how, for including others in their knowledge-sharing networks. Connectivity is the key in the 21st century – reward the connectors in your organization!
- Utilize computer systems that facilitate conversations and sharing of knowledge – think *communication*, not storage/retrieval. Wikis, blogs, online communities, are all *social media* that are producing payoffs in organizations of various sizes.
- Help women and people of color connect to key knowledge flows and communities in the organization. Inclusion into “what is happening” in the organization may help eliminate the glass ceiling and improve the retention of these valuable resources.
- Recruit new hires through the networks of current employees – they will be happier, adjust quicker, and stay longer. “It takes one to know one” is a useful lesson when recruiting new employees.
- When transferring employees to new projects or departments keep in mind their *connections*. Exchanging employ-

ees with a diverse network of ties can create shortcuts between departments or teams and greatly improve overall information flow and knowledge sharing between key parts of the organization. Exchanging well-connected employees between two departments creates an *overlap* which enhances the transfer of information and influence between the two groups.

For the HR department it is no longer sufficient to just “hire the best.” *You must hire and wire!* Start new networks, help employees and teams connect to existing clusters and communities. Connect the unconnected for the benefit of both the employees *and* the organization!

What is connected knowledge? A competitive advantage! Your competition may duplicate the nodes in your organization, but not the pattern of connections that have emerged through sense-making, feedback and learning within your business network. And if you get Vancho’s take on Einstein’s formula correct, then connected knowledge is pure energy!

In the 1992 U.S. presidential race, one simple phrase refocused and re-ignited a jumbled campaign effort by Bill Clinton – “it’s the economy, stupid.” Adaptive 21C businesses see the benefits in managing connected organizations. We can adapt the old campaign slogan to reflect the new business reality – “it’s the connections, stupid!”

Valdis Krebs is a management consultant, researcher, trainer, author, and the developer of InFlow software for social and organizational network analysis [SNA/ONA]. InFlow maps and measures knowledge exchange, information flow, emergent communities, networks of alliances and other connections within and between organizations and communities. Since 1987, Valdis has participated in almost 500 SNA/ONA projects. Clients such as IBM, Google, Northrop Grumman, Lockheed-Martin, Raytheon, Boeing, Europol, Aventis, Solvay, Merck, Genentech, Cardinal Health, Kaiser Permanente, and various government offices, and hundreds of independent consultants use his software and services to map and measure networks, flows, and relationships in organizations, communities, and other complex human systems. He is an often quoted expert on network analysis and network weaving. His work has been covered in major media including Business Week, Business 2.0, The New York Times Magazine, Fast Company, CNN, Entrepreneur, First Monday, Optimize Magazine, Training, and PC. Krebs has undergraduate degrees in Mathematics & Computer Science, and a graduate degree in Organizational Behavior/Human Resources and has studied applied Artificial Intelligence. He has given invited talks on organizational networks at UCLA School of Public Policy and The Anderson School of Management, Michigan State University School of Labor and Industrial Relations, Weatherhead School of Management - Case Western Reserve University, Cleveland State University, University of Michigan Business School and many others. He can be reached at valdis@orgnet.com.