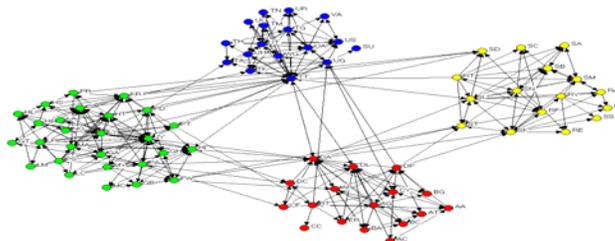# The NETWORK ROUNDTABLE at the UNIVERSITY OF VIRGINIA

# Critical Connections:
# Driving Rapid Innovation with a Network Perspective

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## Abstract

Innovation remains central to an organization's ability to adapt to changing markets and technologies. However, increased complexity of most new products and services, reduced development cycles, and leaner budgets have meant that innovation efforts must bring together a depth and breadth of expertise—from both inside and outside the firm—faster and more effectively than ever before. To do so, managers must address three obstacles to innovation that often arise from informal networks: 1) *fragmentation* of networks at points that invisibly undermine efforts to innovate along desired trajectories; 2) *domination* of networks by particular perspectives and expertise (and *marginalization* of others), unwittingly creating an innovator's dilemma trap and 3) *insularity* keeping an organization from effectively leveraging external expertise. This article advocates a network-based view that allows executives to assess innovation biases and articulates five practices to more efficiently drive innovation through effective networks.

**Critical Connections**

*From the late 1970s until the late 1990s, Apple charted its own course. Intent on leading the computing revolution single-handedly it somehow missed out on the growth in the personal computer market. The Apple Newton, introduced in 1993, reflected the nadir of that culture as a group of elite engineers worked in seclusion to build a computer that was overpriced and underperformed in the market. No product demonstrates Apple's changed perspective since the dark days of the Newton more than the iPod. Its elegant design has received accolades, but underneath that design lies the real innovation of Apple's new venture: the network that connects hardware (Mac or PC), software (iTunes), music distributors, and even artists in ways that no other competitor has yet matched. Even Apple's fabled engineers saw the value of outsourcing the iPod's circuit design to a consulting firm that had designed many of the MP3 players already on the market. These same engineers also bought and built on an existing program for the iTunes software and made various other decisions to re-use existing ideas in innovative ways. In so doing Apple brought iPod to market in under eight months and demonstrated how even relatively simple innovation efforts can enjoy substantial success by fluidly tapping expertise in networks inside and outside of an organization.*

Substantial advancements in technology, science, manufacturing and even global politics have made rapid innovation a business imperative while, at the same time, reducing the advantage gained from it. A recent Boston Consulting Group study showed that roughly 3 out of every 4 executives are planning to increase their spending on innovation yet almost half of them are not satisfied with the returns they're currently getting for their investments. No wonder, as the time advantage enjoyed by successful new products has shrunk dramatically. Competitors use widespread design, manufacturing, and distribution networks to reproduce similar offerings almost overnight. The result is that innovation provides an advantage only for those who are able to minimize the time and costs of developing new products and services.

Of course this is easier said than done. Increased complexity of most new products and services, reduced development cycles, and leaner budgets require that innovation efforts bring together a depth and breadth of expertise—from both inside and outside the firm—faster and more effectively than ever before. Yet rather than facilitate fluid collaboration throughout an organization, most efforts to drive innovation stem from the myth of the single, blinding insight. The idea of a brilliant employee or sequestered team creating the next light bulb, sticky notes, or software program remains the dream of many modern firms. We're seduced by the simplicity of these heroic stories when, in fact, they are usually wrong. For example, the story of 3M's post-it notes is a story of collaboration and evolution that unfolded between the research scientist, Spencer Silver, and product developer Art Fry and countless others who lent critical support throughout its development. Even Thomas Edison's success depended upon a team of others—from the 15 engineers in his Menlo Park laboratory to financier J.P. Morgan (and his critical influence over the gas industry and regulatory agencies) to the men like Samuel Insull who grew the utilities that made electricity a profitable business.[i]

We must acknowledge the historical and collaborative roots of most successful innovations and design organizations that enable employees to more seamlessly leverage colleagues' expertise at

the point of need. This does not mean simply adding more meetings, layering on yet another collaborative technology or hoping for innovation to occur after a restructuring or acquisition. These solutions are driving costs of collaboration sky high in most organizations with little if any evidence that they are creating connections with a payoff. History teaches us that most breakthrough innovations are re-combinations of existing ideas or technologies: the integration of which occurs through informal networks.[ii] While traditionally these networks have formed in very serendipitous ways, it is becoming increasingly important for executives to cultivate and "manage" lateral and external connections. Successful innovation will come from targeted initiatives ensuring connectivity amongst those with the right expertise in a given domain and those with the right influence in the organization—the people who have a unique ability to get things done by virtue of their position in the network.

Failures to innovate effectively and efficiently can often be traced back to two categories of network problems. First is the inability *to effectively recognize, re-combine, and leverage expertise that is in-house or accessible through extended networks*. Too often organizations focus innovation resources in one small group, tell them to scan the horizon for the next breakthrough idea, and end up missing myriad opportunities to re-combine the existing ideas and expertise spread across the people within their own organizations. Second is the inability *to react effectively when people do recognize new opportunities*. While the first is a failure to exploit existing expertise and networks at an organization's disposal, the second is an inability to drive change through those networks—to reshape them in ways that create new value and open new markets. This article will show how a network perspective can reveal hidden barriers to innovation as well as ways that organizations can create more vibrant networks.

## A Relational View of Innovation

If we shift our perspective to see innovation not as the generation of new ideas by individuals and small groups but rather as the flow of knowledge and capabilities into and across an organization we see new opportunities. Rather than hiring and promoting for individual brilliance, sequestering small teams with a charge to generate a blinding insight or engaging in yet another corporate restructuring to break down silos, the issue of importance becomes one of mobilizing a network of relevant expertise. By mapping information flow, problem solving and decision-making interactions in organizations or groups charged with innovation (e.g., R&D, new product development teams or learning-oriented alliances) we can make visible the patterns of collaboration that either support or undermine innovation. Across more than 20 organizations we have seen this view help executives address three key innovation obstacles:

- **Fragmentation.** Collaboration often breaks down across physical distance, functional lines, technical capabilities and occupational sub-cultures in ways that invisibly undermine strategic innovation efforts.
- **Domination.** The voices of a few central network members can drown out novel ideas, driving innovation efforts along traditional trajectories long after the market has veered in another direction.
- **Insularity.** Inability to recognize and leverage relevant external expertise can yield excessive cost structures and time delays that result in missed market opportunities.

Of course these obstacles are not new, but they are increasingly problematic in a business environment where rapid and targeted collaboration is central to innovation. This needs to

change. The networks distributed throughout an organization, though seemingly invisible and intractable, provide a substantial lever to improve both success and efficiency of innovation efforts. In the remainder of this article we will discuss each of the above obstacles with a short case example to show how a network perspective can help illuminate these biases. We will then conclude with five practices that develop more vibrant networks.

**Fragmentation:** Leaders often pursue innovation through efforts to integrate specialized expertise via team and project staffing, methodologies to institutionalize new product or service development, internal organizational restructurings, alliances and even mergers or acquisitions.[iii] Akin to an x-ray, network analysis can enable a leader to see whether collaborations amongst those with complementary expertise are occurring in ways that support innovation objectives. Unfortunately, it is very common to see networks fragment precisely where management had been counting on integration even when all formal organizational levers have been pulled to promote collaboration. Organizational charts or process methodologies—though seemingly logical views of work—miss relational dimensions critical to knowledge creation and innovation. A network lens can help managers target points in a network where collaboration must be improved to support strategic innovation efforts.

Consider the plight of a seasoned partner in a well-known professional services firm.  He had enjoyed a very successful career and because of this had been tasked with leading a group of 50 experts to develop new methodologies and service offerings.  To create client solutions that generated revenue for the firm as quickly as possible, he merged these experts into three tightly-knit groups all under his control.  Each had specific expertise required to move a service offering from idea inception to commercial viability; however, a year after the restructuring the innovation process had not improved as much as he had hoped based on service offerings produced and revenue impact.  Given the millions of dollars invested in this group annually and the strategic imperative of innovation for the entire firm, this was not a trivial issue.

Network analysis provided the ideal approach to demonstrate how collaboration was occurring within and between relevant functions in the innovation process. In this case, we conducted an assessment of the entire group and then highlighted people in the network by their function to see where lack of integration might be undermining innovation (See Figure 1).

<div align="center">**Editor's Note: Insert Figure 1 About Here**</div>

The information network reveals a lack of integration across functional lines – despite these functions having been merged under one leader—and this fragmentation dramatically under-mined innovation.  First, there was lack of integration between the Research and Solutions group.  The Research group consisted of senior-level employees whose responsibility was to develop new ideas and have them reviewed and validated by technical "specialists" before being released to the client-facing Practices.  The Solutions group "productized" these ideas into client solutions, by defining the value proposition, a description and summary of the solution and creating any sales documentation to be used by the firm's consultants.  Rather than engage in idea development and commercialization jointly, these two groups had been working sequentially. This resulted in inefficiencies cropping up due to misunderstandings in the handoff of an idea and lack of follow through because ideas were developed in isolation.

Another silo—between the Research and Practice Support groups—undermined the uptake of new offerings throughout the firm.  Practice Support interacted directly with the firm's consultants in introducing new solutions and so received feedback that could benefit the Research group. Unfortunately, by organizing around a process-based view of innovation, Practice Support was twice removed from Research—Research passed ideas to Solutions who then interacted with Practice Support.  According to a Research leader, "Sometimes we are thinking in a vacuum and lose the practicality of an idea.  The problem is Partners don't always have the time to give us feedback.  It's not billable time.  Practice Support could be that feedback loop."  Even collaboration between the Practice Support and Solutions groups was not what it should have been as only one person—#40 in the diagram—acted as a liaison between the groups.  While being prominent in the network was good for #40, it was ineffective for the whole group, especially in times of crisis or when real-time response was needed.

Finally, substantial network inefficiencies were driven by the firm's formal review process.  All new commercial offerings needed to be reviewed and validated by both subject matter experts and senior management for technical merit and risk analysis.  Getting reviewers (often Partners) to respond was challenging since they were doing client work.  The key to a faster review process was a personal relationship with a given set of Partners.  Senior managers from both the Research and Solutions group had an advantage here over less-tenured personnel due to their knowledge of the network and established relationships. The end result was a hierarchical decision-making and approval process: an issue visible in network diagrams showing senior personnel to be overly central in the network.

**Domination.**  A second network bias arises when a small number of people (often holding expertise good for *past* purposes*)* become dominant in information and decision-making networks.[iv] An entire organization can face an innovator's dilemma when a small group becomes overly influential in defining what information and opportunities are considered legitimate. For much of its history, Apple was run by electrical engineers and, as a result, often developed technically superior products that missed the market and were burdened by high manufacturing costs. Similarly, Microsoft's initial dismissal of the Internet stemmed, in part, from its history in personal computing software. Effective innovation derives from more than just having the best and most relevant talent in-house. Leaders must also consider how influence of those with certain kinds of expertise affects opportunity recognition and action within their organization. A network perspective can help management determine if old paradigms and solutions are dominating while more relevant but emerging expertise has been relegated to a peripheral network position.

This was seen in the information and decision-making networks of the R&D function in a well known consumer products organization. Here our analysis identified fragmentation across function, hierarchy and physical distance that was undermining certain innovation efforts. But it also revealed how expertise of those in influential network positions had a pervasive and enduring impact on the entire R&D function. For example, micro-biology expertise is critical to food products: this is a domain where mistakes can result in substantial consumer health problems. To guard against this risk, management had hired expert scientists who, over time and through many seemingly small interactions, had moved into highly central and influential

network positions. This subtle and invisible movement had created an overly rigid informal screening process. Prudent risks could have extended innovations in this domain but were not taken as novel ideas were labeled off-limits in conversations with these scientists well before being elevated to decision-makers for formal consideration.

Managers can visualize the comparative influence of expertise by re-shaping nodes to reflect each person's knowledge or skills. For example, Figure 2 shows how one technical competency, nutrition, was central in this R&D network and so influenced opportunity recognition in myriad conversations that occurred outside of the formal review process. In this case, senior management indicated that opportunities were being missed because technical reputation of a few well-connected scientists had become more important than prudent exploration of new and potentially disruptive ideas. An example lay with research into low glycemic foods (i.e., foods with slow to digest carbohydrates that make you feel fuller, longer) which several food companies were pursuing as the next big opportunity following the low carbohydrate diet craze. While successful in Canada and Australia, science behind the glycemic index was still new and controversial in the US. Rather than take what many felt was a prudent risk in this domain, a small subset of well connected scientists managed to reject this as a product platform because, in part, a failure would damage scientific reputation. In contrast, other important kinds of expertise such as sensory science or quality services had been relegated to the edge of the network.  These were technical competencies that if incorporated early in new product development discussions could yield substantial quality and efficiency benefits. Yet this expertise had become marginalized: rather than collaborative problem solving discussions these employees were approached and told what those in more central network positions required.

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Of course knowing something is only one determinant of who is heard in an organization. Beyond expertise, dominant voices arise and become privileged due to power, unique information access and decision-rights that accrue to those in positions of authority. This was clearly the case in the R&D function of a major electronics organization that was losing market share due to lackluster product enhancements. Here our analysis revealed that young engineers with cutting edge knowledge critical to product functionality had become isolated while those high in the hierarchy were exerting their largely obsolete technical expertise through central network positions and so putting a chokehold on new ideas. This is but one example of a more general problem where R&D leaders strive to remain technical experts (as opposed to becoming good leaders) and in the process, drown out alternative perspectives. The more senior the person the larger this problem can become as s/he is typically not challenged on a technical level and has the resources to drive substantial and possibly off-base investments.

**Insularity**. For organizations to innovate effectively and efficiently it is no longer possible to own all competencies and technical expertise. To reduce development time and costs, many companies are outsourcing innovation efforts, including their research and development activities.  For example, major pharmaceutical companies are now outsourcing 30% of research and 50% of development activities.[v] In the US roughly 65-70% of PDA and notebook PC designs are being outsourced.[vi] While it is increasingly important for executives to turn externally for key knowledge and skills, they must do so with an informed eye to the

effectiveness with which critical expertise is sourced and migrates into their organization. A network perspective allows management to identify gaps or inefficiencies in sourcing strategies.

Consider a pharmaceutical company where the opportunities for leveraging knowledge across disease areas, such as cardiovascular or asthma, were substantial. Sharing effective mechanisms, results of experimental models and late development stage candidates that could be used in multiple disease areas could yield significant benefits. However, leveraging research across drugs required effective collaboration both internally among different research groups and externally with academic institutions, outside research centers, and alliances with other companies. This organization applied network analysis in a number of therapeutic areas to assess the quality of both internal and external connectivity. The network shown in Figure 3a is of a critical therapeutic area which, our analysis revealed, had an extensive and balanced set of external relationships with academic institutions. Yet even this well connected therapeutic area caused concern for management due to the concentration of important external relationships in just a few key people. For example, Figure 3a makes clear the extent to which just 12 of the organization's scientists held the bulk of important external ties while Figure 3b shows that removal of just the top four scientists reduced external connectivity by 50% (72 out of 143 interactions). A very high percentage (80%) of the interactions between the pharmaceutical organization and academia were one-on-one, making management concerned not with whom the scientists were connected to but rather with the vulnerability of these critical sources of knowledge should key scientists leave.

**Editors Note: Insert Figure 3 About Here**

Another substantial way that organizations acquire expertise is through alliances or other formally established relationships between entities. Here a network perspective can reveal the trajectory of learning in external collaborations established for purposes of knowledge acquisition. For example, in the same pharmaceutical organization, we also assessed the network of an alliance intended to rapidly reach a billion dollars in sales of a drug by leveraging each organization's unique expertise in marketing, distribution, basic science and FDA approval. Unfortunately delays and cost over-runs had all but brought the alliance to its knees. Network analysis helped to isolate a series of problems such as ineffective distribution of decision rights, dominance of the network by one alliance partner, lack of network connections amongst counterparts from each organization (such as sales or manufacturing) and a surprisingly strong effect of cultural differences, driving fragmentation at key points in the alliance network.

These barriers—fragmentation, domination, and insularity—undermine many organization's ability to identify and execute on innovation opportunities. From a more traditional perspective of innovation as deriving from individual or team inventions and achievements, these barriers might be over-looked and considered to have little effect on the quality or speed of the innovation process. But viewing innovation as the flow of knowledge and practice into and across an organization reveals how small changes in network characteristics can have large effects on an organization. Applying network analysis to groups charged with innovation yields myriad opportunities for improvement by making visible the network interactions critical to planned and emergent innovation. In the following section, we describe five practices that we have seen and used to overcome these network barriers to innovation.

**Five Practices to Drive Innovation through Networks**

**Create a network-centric ability to sense and respond to new opportunities**. Innovation often derives from an ability to fluidly capitalize on new opportunities regardless of functional, hierarchical, geographic or organizational lines. In the ideal, networks enable organizations to "surge": to sense opportunities or problems in one pocket of a network and rapidly tap into the expertise of others in the network to coordinate an effective response. This is not about pushing a greater volume of information through a network or fixing current gaps but rather about creating networks that have the ability to morph to new problems.

Building awareness or meta knowledge of who knows what in a network is critical for people to tap the right expertise at the right time rather than not respond to opportunities because no one knew that the expertise existed, or attempt to respond to opportunities but with less relevant local knowledge. Consider the R&D function from the consumer products organization above. As part of a broader effort, management held an offsite to help improve collaboration across aspects of formal structure (e.g., functional lines, hierarchical levels or project groups). Of course many of us have been to off-sites or all-hands meetings and fallen into the network trap where we simply re-connect with people we already know. Quite often off-sites serve to entrench networks rather than expand connectivity at points that matter for the organization. But in this case efforts were taken at every step to ensure bridges were built across gaps that the network analysis revealed both existed and had the potential to impede innovation. Everything from how tables were staffed and then rotated to the kinds of problem solving sessions people participated in were geared towards building out connectivity with a potential payoff—not just mingling to build a bigger network.

One of the more interesting activities involved use of an electronic name tag that each person was given as they headed off for dinner and drinks at the end of the first day. These electronic badges had the ability to communicate with every other badge in the room and helped broker introductions. But not just any introductions. We programmed two things into each tag: 1) each person's existing network and 2) the skills that person needed to better collaborate with for the organization to innovate in certain ways. The tags then helped broker very targeted introductions that held value for the organization rather than allowing people to simply connect with those they already knew or those that had similar expertise.

In practice, this meant that people would mingle until their badge indicated they were in the proximity of another person that was both outside their network and had expertise they should be connecting with. When that happened the badge would light up and flash a welcome to the other person to the effect: *Hi Bob. We should be talking about BioChemistry.* So the first function the tags served was to create introductions that were task based and value added for the organization – not just a "more connectivity is better" approach to collaboration. It also generated a great deal of energy and enthusiasm in the room. The hardest people to get to network are scientists, engineers and financial types. But a goal oriented approach to networking, and a little competition, dramatically improved peoples' receptivity to and engagement in the process.

Further, if people stayed connected to each other for a while and had a deeper conversation that potentially created value for the organization, a network link between the two people would be logged with the nametags. This link was then transported to the front of a large ballroom where

it appeared on two very large screens so that people could see the network being built in two minute increments.  This added to the sense of energy in the room to be sure.  But more importantly, and the second function of the name tags, is that it gave management a baseline of potential value added connections to explore.  In six or nine months, they had the ability to determine where certain innovative opportunities had been realized and where potential still lay.

**Develop an ability to rapidly test/refine an opportunity rather than get caught in grid-lock.** Effective innovation is about action as much as vision. For the companies that do this well, executing on innovation is not a fire drill but the result of a network that can rapidly combine and deploy resources to test the potential of many different opportunities.  Sony's inability to create a successful product for the portable MP3 player market—a market they dominated for decades with their Walkman—was not a failure of vision, but of action.  By the time Apple introduced the iPod, the market for digital music players was already taking its first steps. Napster was (in)famous for enabling online music sharing, jukebox software was already organizing the digital music files on your PC, and portable MP3 players were already on the market. Sony engineers and executives saw these opportunities at the same time as Steve Jobs and his team at Apple. But Apple was able to execute while Sony was not, despite having entire divisions devoted to the Walkman, the personal computer, and even music labels.

Organizations need to be able to rapidly explore emerging opportunities. For companies that have relied on large-scale research and development investments to chart the future, this represents a fundamental shift away from envisioning a single future to rapidly testing a range of possible futures. In no small part this is a network issue, as lack of action often boils down to unclear or overly-burdensome decision-making processes. When decision-rights—who can make what kind of decision—are unclear, everything elevates up the hierarchy, creating bottlenecked networks and sapping the energy of those with innovative insights. Mapping decision-making networks can quickly reveal where certain decision-rights need to be defined and/or re-allocated to allow for more rapid prototyping of ideas. After a change process, a decision-making network can also reveal if employees are taking action or have been culturally conditioned to not take risks and so continue to seek approvals. Several executives have used these networks to identify people in key network positions and encourage them to take prudent risks – an approach which helps fight fear and promote creativity in a targeted and personal way that rapidly diffuses through the network (rather than impersonal, broadcast communications exhorting the masses).

In addition to decision-making, the ability to rapidly build and test innovations requires resources inside the organization—and sometimes with customers or suppliers—that can be mobilized around a new opportunity.  In some cases, this means having programmers or a model shop ready to turn an idea into a functioning prototype. For example, in one consumer goods company, we converted a conference room into an informal model shop where employees, from engineers to marketing executives, could rapidly mock up their ideas. The ability to prototype can also be enabled by trusted suppliers who can quickly provide new and promising materials or design changes, or retail partners who can make shelf-space available for a brief test of the market. For example, one company we have worked with invested in developing a relationship with a trusted retail chain.  Using a particular set of their stores, they developed the capability to test-market new products quietly and easily—getting feedback from not only customers but also store managers and staff. Regardless of how enabled, the ability to rapidly prototype via some

reasonable level of pre-defined resources and authority is critical to gaining proof of concept, learning and success stories that enable innovations to gain momentum in a network.

**Magnify returns on human capital by working through those in specific network positions.** People in privileged positions in their organization's information networks—not always or even usually those high in the formal hierarchy—can have a substantial impact on how an innovative idea is developed and implemented. We often use network analysis to engage these highly influential people in brainstorming or problem-solving sessions rather than the more traditional approach where senior management selects those they know and/or like based on a limited set of interactions. First, network analysis helps identify key brokers: those that hold the entire network together by virtue of relationships across sub-groups and formal structure. By sitting on the shortest informational path between everyone in the network, brokers are often the most aware of expertise and resources inside and outside of an organization that can be leveraged. Second, network analysis helps identify those with expertise relevant to a given innovation. Coloring nodes (people) in the network by technical competency(s) and finding those most sought out for expertise relevant to an innovation identifies employees with both technical depth and ground level credibility in the eyes of their peers—attributes that are important to both the development and implementation of a new idea.

Tapping people by virtue of their position in the network increases the likelihood of success by engaging those with the best expertise and greatest influence in the network. This yields a different knowledge and influence base than the more traditional approach where managers pick either those in positions of formal authority or those they know. Consider Figure 4a, which represents people likely to be selected for an innovation effort based on formal position. Unfortunately, these people are not the best choices. They are central only in their own group, are most likely to be wedded to a certain way of doing things, may not have a good sense of the capabilities of individuals outside their immediate group and are not necessarily influential in other groups that might need to coordinate efforts to implement an innovation. In contrast, brokers in Figure 4b are better candidates. Their network position makes them more aware of resources and expertise dispersed throughout an organization and they are more likely to be successful at crafting a viable solution because of their understanding of political dynamics and cultural values in sub-groups.

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In addition to bringing the right people into the room, brainstorming workshops (or processes if done over a longer period of time) can increase likelihood of success by engaging the broader network. Involvement of others in the inception of an idea is critical to both idea quality and ease of implementation.  In the words of one senior technology executive, "A sure way that innovation has consistently failed here for decades occurs when ideas are developed in isolation. No matter how right or good they might be it is the most consistent death knell to an initiative we have." Efforts should ensure brokers reach out to other key connectors in the network at two separate points:  initially to assess and improve solution quality before a given problem space has become solidified and again later in the process to address hidden implementation obstacles that people brainstorming in a room by themselves might have overlooked.

**Leverage "energy" in a network as a key determinant of innovation and progress.** To this point, we have focused on networks solely in terms of information flow. Yet most of us rely on relationships at work for more than just information. In networks where relationships are not prescribed by formal structure, emotion plays a substantial role in who people learn from—particularly in creative interactions where someone is on new ground and not just looking for answers to known problems. Mapping energy or enthusiasm in networks—simply asking people to indicate others where they leave interactions enthused (and those that are draining)—provides a powerful indicator of where creativity and innovation is occurring. In the words of one executive: "You have to be energizing to get people to listen to your idea to begin with and certainly energizing to get them to help you implement it or accept it. Nothing gets done here, it seems, without someone somewhere getting enthused about an idea and then enthusing others."

Assessing network diagrams of energy or enthusiasm is a very simple addition to a network analysis, with highly revealing results. For example, these diagrams can highlight where connectivity is strong across certain functional lines or kinds of expertise such that creativity and effective collaboration is likely to occur. Focusing on these points can be a quick way to gain ground on both planned and emergent innovation opportunities as managers can see where ideas are bubbling up in the network. Similarly, these assessments help reveal those people who are engaging others in the network. Providing these emergent leaders with room and some resources is another way to leverage the natural flow of ideas in a network. Finally, energy or enthusiasm networks can help a leader locate what we call vacuums (where a lack of energy exists) or vortexes (where negative energy is draining a group) at intersections that must work well for the organization to innovate in ways that support strategy.

Network analysis can identify where opportunities for improvement lie and so help leaders target development of specific behaviors our interviews have revealed to be consistently associated with positive energy.[vii] These behaviors can be developed via coaching, career development processes, embedding behavioral dimensions in project or team evaluations or simple self assessment. Regardless of approach, where energy is lagging, probing on the five questions in the sidebar at either an individual or group level can have a dramatic impact on shifting those people just doing one or two things wrong. While difficult to convert extreme de-energizers (where negativity is tied up with personality), helping those who are unwittingly not exhibiting some simple behaviors can have a dramatic impact when propagated throughout a network.

Sidebar: **Energizing Behaviors**
- Do you do what you say you are going to do and address tough issues with integrity? People are energized in the presence of others who stand for something larger than themselves. They allow reservations to fall away and enthusiasm to build when they can trust that others will follow through on commitments.
- Do you see realistic possibilities in conversations and not focus too early or heavily on potential obstacles? People get enthused in the presence of attainable possibilities. Too often de-energizers claim they are playing devil's advocate but keep ideas from ever getting off the ground by surfacing only problems and never venturing solutions.
- Are you mentally and physically engaged in meetings and conversations? Energizers are not necessarily wildly charismatic, but they are always fully present in conversations. Rather than going through the motions of being engaged—something that is much more

transparent than de-energizers think—they show their interest in the person and the topic by bringing themselves fully into a given interaction.

- Are you flexible in your thinking and do you use your expertise appropriately? Too often, experts or leaders destroy energy in their haste to find a solution or demonstrate their knowledge. People want to be a part of something meaningful. Energizers get ideas and create a sense of purpose in others by drawing them into conversations and projects.
- When you disagree, do you focus attention on the issue at hand rather than the individual? Energizers are quick to disagree when things go off track, but they do so in a way that does not tie their critique of an idea too tightly to the person who made the suggestion. Their approach allows a continued improvement in the idea and also avoids marginalizing that person and their current and future contribution to the conversation.

End Sidebar


**Ensure organizational context helps innovation occur fluidly throughout a network.**
One of the most common network barriers to an organization's ability to reconfigure resources into new innovations stems from organizational context—formal design, planning and budgeting processes, reward systems, culture and leadership—that drive parochial behavior. Too heavy a focus on individual achievement creates silos in networks that undermine innovation opportunities from individuals and project teams seeking out and leveraging knowledge and skills in other corners of the organization. For example, recently, one top IBM executive publicly criticized the firm's reward structures, which pitted divisions against one another: "We don't talk to people in other operations. They have become the competition. There is no sharing of information and limited cooperation."[viii] In our own work we have seen collaboration between R&D groups stall when it took longer to get approval to "transfer" the human resources from one project to another than to actually get the work done.

While executives will not be able to entirely over-haul organizations to create the ideal collaborative context, they can at least make sure that fragmentation across certain aspects of formal structure or distance are not invisibly impeding innovation. In one company, for example, formal "dual-citizenship" roles were established to allow someone in research and development to collaborate with others in the business units without requiring internal budget transfers or formal project re-assignments. Another option is to create ad hoc teams around particular organizational capabilities and create a cost structure supporting that team which shares the burden across more than one business unit. Within Hewlett-Packard, for example, a small team developed an expertise in supply chain management. By working with different divisions and plants to optimize their local supply chains, this group was able to move the best ideas and practices across divisions that traditionally competed. 3M has also developed a number of technology labs in this way—rather than hope the divisions will seek out and learn from each other, they made it the charter of these labs to move ideas across the organizational boundaries that others could not as easily cross.

The entire human resources chain can affect collaboration by informing the kinds of people brought into the organization, the way in which they are developed, and the behaviors that are measured and rewarded. Too much emphasis is typically placed on individual achievement—as opposed to team performance—in the hiring and promotion process. IDEO, one of the largest and most successful design and innovation firms, has developed an employee evaluation process

that is based on peer review. Future projects, promotions, and even bonuses are driven by feedback from those you have worked with, not just for, on your project and on the other projects. Further, project teams at IDEO are usually able to choose who they want to work with, creating an informal reward system that identifies who is collaborative and who is out for themselves. Leaders and managers are also highly influential in changing people's beliefs about the effective pursuit of innovation through the messages that they communicate in their talks and actions. For example, project team managers at one electronics firm insisted on having engineers present to senior management—the practice not only emphasized the collaborative nature of the work, it also strengthened the networks connecting the project teams as engineers from different projects were able to meet one another.

In short, effective collaboration is a holistic challenge. Simply introducing a collaborative technology, tweaking incentives, or advocating cultural programs to promote collaboration is often insufficient. Promoting connectivity requires the alignment of unique aspects of formal organizational design, control systems, technology, and human resource practices. And beyond organizational architecture, specific cultural values and leadership behavior can have a striking effect on patterns of collaboration, often overriding seemingly aligned designs. The right elements of context to work with are unique to each organization. In some settings, battling an entrenched cultural value (a not-invented-here mentality, for instance) can be critical, while in others modifying division-level planning processes and performance metrics are central to improving a network. While it is rarely pragmatic to suggest a total reorientation of organizational design to support a given network, it has been our consistent experience that three to five aspects of context provide high-leverage opportunities for improving collaboration in a way that has a strategic impact for an organization.

**Conclusion**

Many have declared the death of the lone genius but barriers to innovation in organizations remain as a product of this myth's legacy. The major barriers to innovation today result not from failures of individual genius but rather from failures of collaboration—inability to exploit the existing capabilities of an organization in new and revolutionary ways. Here we have identified three of the more common breakdowns in an organization's networks that undermine the innovation process as well as a series of relatively simple, but targeted and powerful initiatives that can help overcome these biases. Having the right human talent in place—a substantial challenge in and of itself—is no longer sufficient. Effective executives need to be aware of how those skills and abilities are distributed, and tapped, within the networks that make up their organizations. In today's complex business environment, those who can read and harness the networks in and beyond their organizations; who can quickly diagnose breakdowns in those networks before they become crises; and who can effectively build new networks around new emerging innovations will be the most successful in increasingly dynamic times.

**Figure 1**
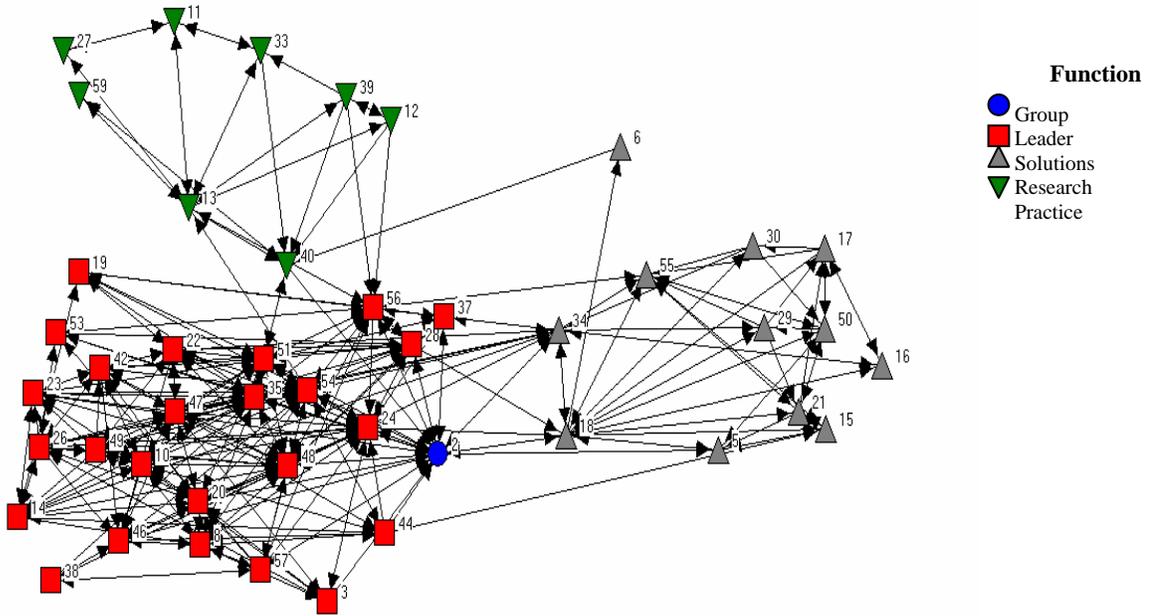Integrating Expertise at a Professional Services Organization

**Figure 2**
**Network Dominance of Expertise in Consumer Product R&D**



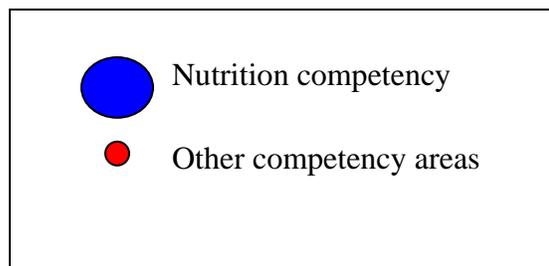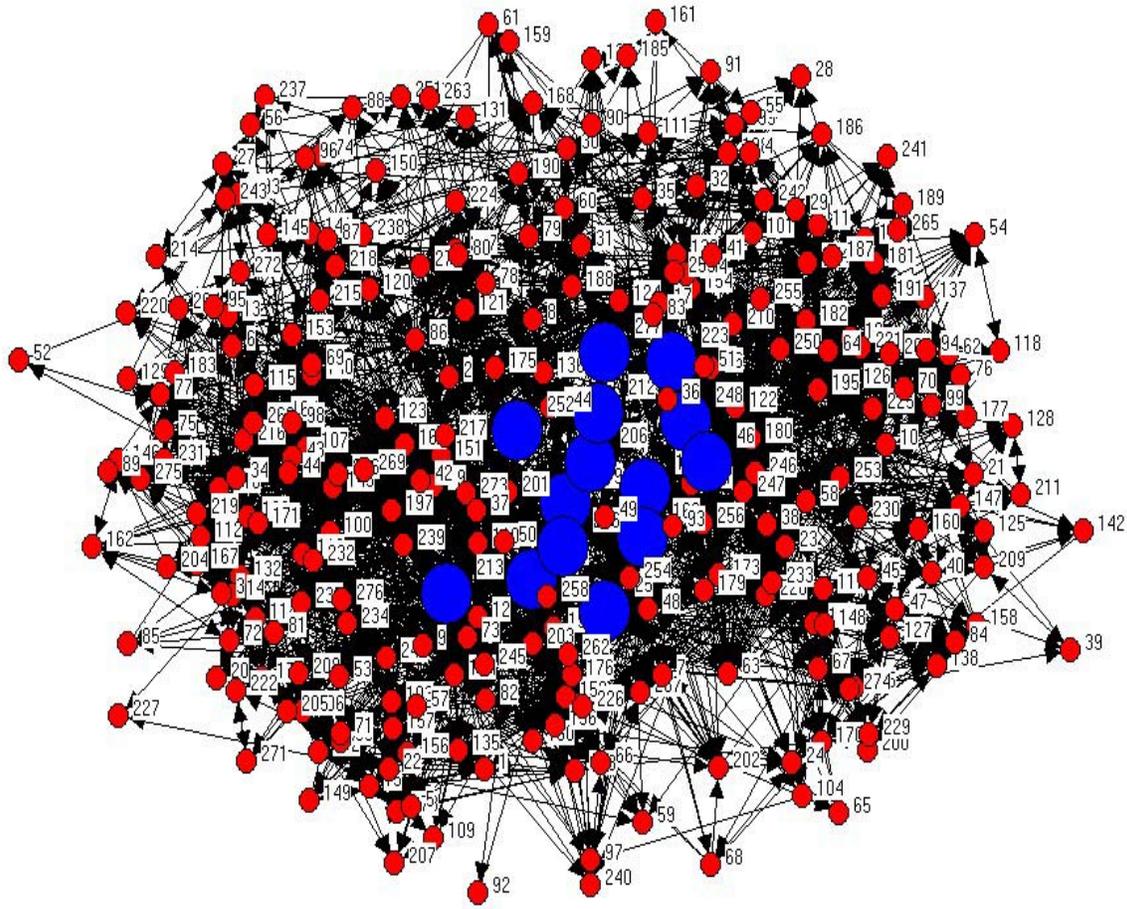Nutrition competency

Other competency areas

**Figure 3a**
External Connectivity in Pharmaceutical Research and Development
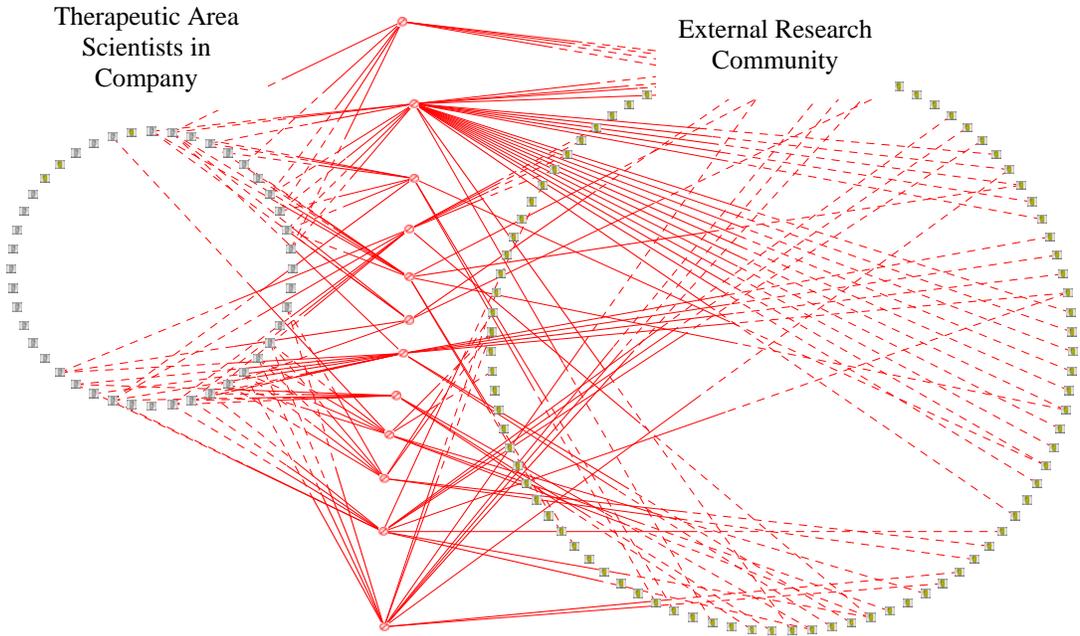
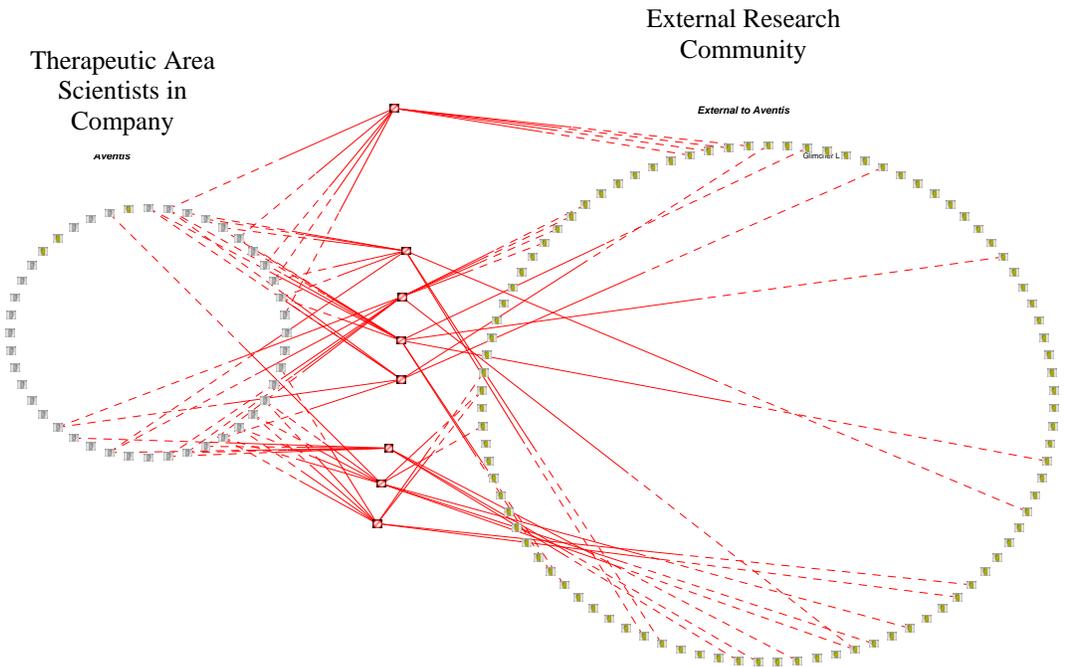**Figure 3b**
Removal of Top 4 Scientists Reduces Connectivity
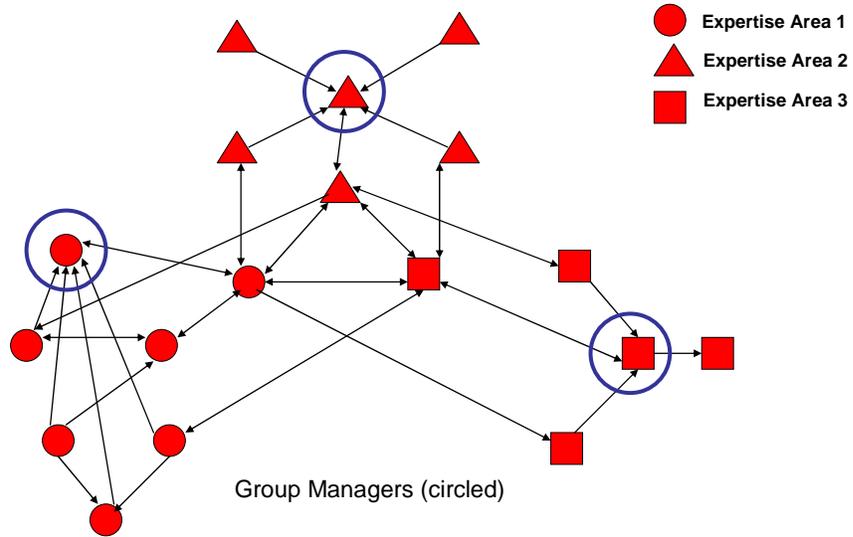
**Figure 4a: Group Manager as Innovation Influencers**


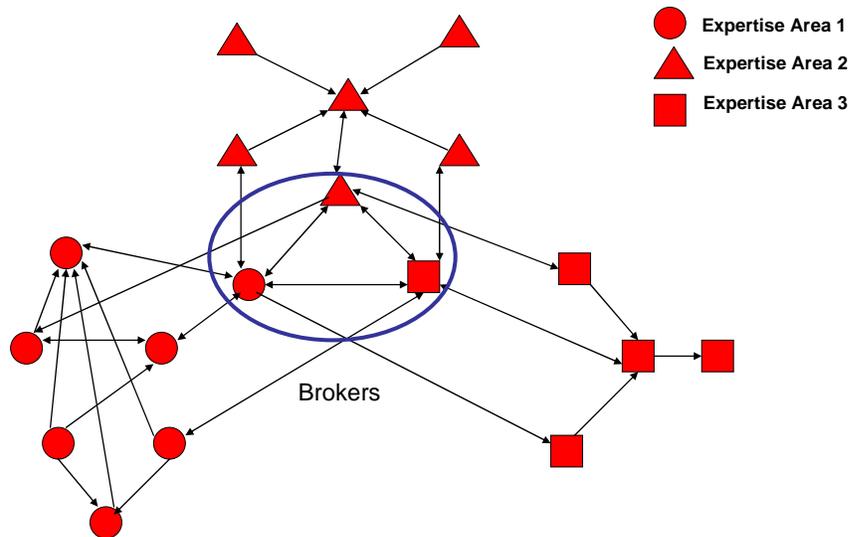
Group Managers (circled)

**Figure 4b:  Key Brokers as Innovation Influencers**



Brokers

[i] Hargadon, A. B. 2003. How Breakthroughs Happen: The Surprising Truth About How Companies Innovate. Cambridge: Harvard Business School Press.; Hughes, T. P. 1983. Networks of Power. Baltimore, Maryland: The Johns Hopkins University Press.; Hughes, T. P. 1989. American Genesis: A Century of Invention and Technological Enthusiasm, 1870-1890. New York: Viking.

[ii] Basalla, G. 1988. The Evolution of Technology. New York: Cambridge University Press; Bijker, W. E. 1995. Of Bicycles, Brakelites, and Bulbs:  Toward a Theory of Sociotechnical Change. Cambridge, Mass.: MIT Press; Hughes, T. P. 1989. American Genesis: A Century of Invention and Technological Enthusiasm, 1870-1890. New York: Viking; Kodama, F. 1991. Emerging Patterns of Innovation: Sources of Japan's Technological Edge. Boston: Harvard Business School Press.

[iii] Brown, JS & Hagel, P. 2005. The Only Sustainable Edge: Why Business Strategy Depends on Productive Friction and Dynamic Specialization. Boston:  Harvard Business School Press; Leonard, D.. & Swap, W. 1999.  When Sparks Fly: Igniting Creativity in Groups. Boston:  Harvard Business School Press.

[iv] For some time scholars have drawn attention to the way in which existing skills and knowledge affect an organization's ability to recognize, assimilate and take action on key information via such terms as absorptive capacity; competency traps; path dependence and collective cognition. Network analysis allows a manager to see exactly what knowledge is disproportionately important.

[v] Innovaro Innovation Briefing, "Out-sourcing vs. Off-shoring – The Shifting Balance for R&D", May 2005.

[vi] Engardio, P. &  Einhorn, B. (with others), "Outsourcing Innovation", Business Week, March 21, 2005.

[vii] Cross, R. & Parker, A. 2004. The Hidden Power of Social Networks: Understanding How Work Really Gets Done in Organizations. Boston:  Harvard Business School Press.

[viii] Crow, R., "Institutionalized Competition and Its Effects on Teamwork", Journal for Quality and Participation, 18 (June 1995), 47.