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Improving Innovation with Organizational Network Analysis

By Stephen Garcia

According to PwC's 17th Annual CEO Survey, product and service innovation is now the number one growth strategy for CEOs globally (*http://www.pwc.com/gx/en/ceo-survey/2014/index.jhtml*). Innovation is notoriously difficult, however. It is a complex, systems-level process requiring that multiple functions—R&D, marketing, supply chain, finance, sales, etc.— work together across silos to ideate, develop, and commercialize new products and services. Fortunately, Organization Development (OD) professionals have a powerful approach, organizational network analysis, for measuring and improving such intricate human systems.

Organizations have evolved from hierarchies to "complex networks held together by new communication and control mechanisms that are being invented out of necessity" (Schein, 2013, p.9). As it turns out, these networks of social interactions are the foundation for successful innovation (Rogers, 2003; Garcia, 2013). It is through the social connections that exist in organizations that new ideas are formed, developed into products, and ultimately brought to market.

OD's understanding of organizations as systems, familiarity with diagnostics, and focus on human dynamics makes it particularly well suited to use organizational network analysis (ONA) to help organizations excel at innovation. Little has been written, however, on how organizations can use an understanding of networks to improve their innovation capabilities; and, less still on the role that OD practitioners can play.

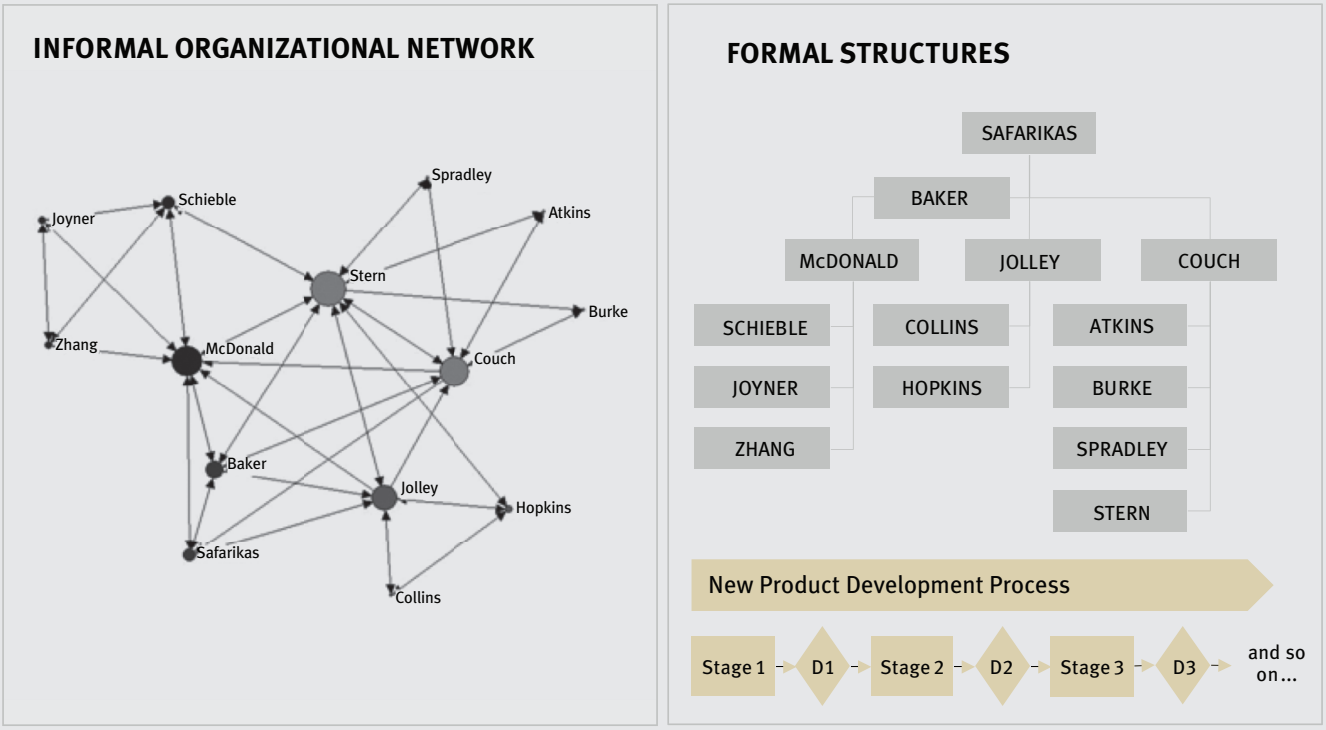
This lack of understanding prevents companies from using an important tool to maximize their innovative potential. At the same time, it presents an opportunity for OD practitioners to leverage their expertise in and understanding of the interplay between formal and informal systems to generate tangible business value in an area of critical importance to CEOs.

This article describes how internal and external OD practitioners can use ONA to put organizations on optimal footing to innovate. First it provides a brief overview of organizational networks and ONA. Next, it presents a framework for identifying innovation improvement opportunities. Finally, the article describes a case study where ONA uncovered opportunities to improve cross-division innovation at a Fortune-500 pharmaceutical company.

Organizational Network Analysis

We begin our discussion of organizational networks with an analogy from nature. We are all familiar with graphite and diamond. In many ways these minerals could not be more different. Graphite is common, soft, and opaque. In contrast, diamond is rare, hard, and translucent. What is amazing is that both graphite and diamond are made entirely of carbon. How can two substances that are so different be comprised of the exact same thing?

The answer is connections. What makes graphite and diamond different is not the carbon from which they are made but how the carbon atoms are connected. In graphite, carbon atoms are



In the organizational network map to the left, circles represent individuals in the organization and lines connecting the circles depict frequent interaction between the individuals. The size of the circle indicates the individual's centrality and influence within the organizational network. Spacing between the circles does not convey information. Visual clarity was the objective for the spacing between the nodes. For more on how network diagrams are created, see Hanneman and Riddle (2005).

Figure 1. Informal Organizational Networks vs. Formal Structures

connected in loosely coupled sheets that easily slough off. This is why graphite is often used as a lubricant in industrial applications. In diamond, on the other hand, the carbon atoms are connected every which way and result in some of the strongest bonds in the universe. In short, connection matters.

Connections matter in organizations too. In the case of organizations, the connections are relationships that exist between individuals. These connections can take many forms. Some examples are problem-solving relationships, decision-making relationships, personal support relationships, and energy relationships.

Since the Hawthorne studies in the 1920s and 1930s, we have known that social interactions affect organizational outcomes. In the last few years, the power of these social interactions has become better understood and we have gained the means to analyze them. We have learned that these relationships serve as important conduits for the transfer of new ideas, knowledge, energy, and personal support. As a result, the configuration, or structure of these relationships in an organization significantly impacts organizational performance (Balkundi & Harrison, 2006; Tenkasi & Chesmore, 2003) as well as individual performance (Burt, 2004). The old adage is true: it is not just *what* people know, but *who* they know that matters.

What is particularly surprising is how different the network of relationships within an organization is from what might be expected based on established organizational charts or defined business processes. *Figure 1* compares an organization's formal structure to its informal organizational network.

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As can be seen from the organization's formal structure in *Figure 1*, Stern is a relatively low-level member of the team. In the organizational network, however, we see that Stern is in fact quite central and plays a critical role in facilitating communication across the three subgroups.

Regrettably, the majority of leaders lack sight of these informal organizational networks. Consequently, they make decisions with incomplete information:

> Many executives invest considerable resources in restructuring their companies, drawing and redrawing organizational charts only to be disappointed by the results. That's because much of the real work of companies happens despite the formal organization. Often what needs attention is the informal organization, the networks that employees form across functions, and divisions to accomplish tasks fast. (Krackhardt & Hanson, 1993, p. 111)

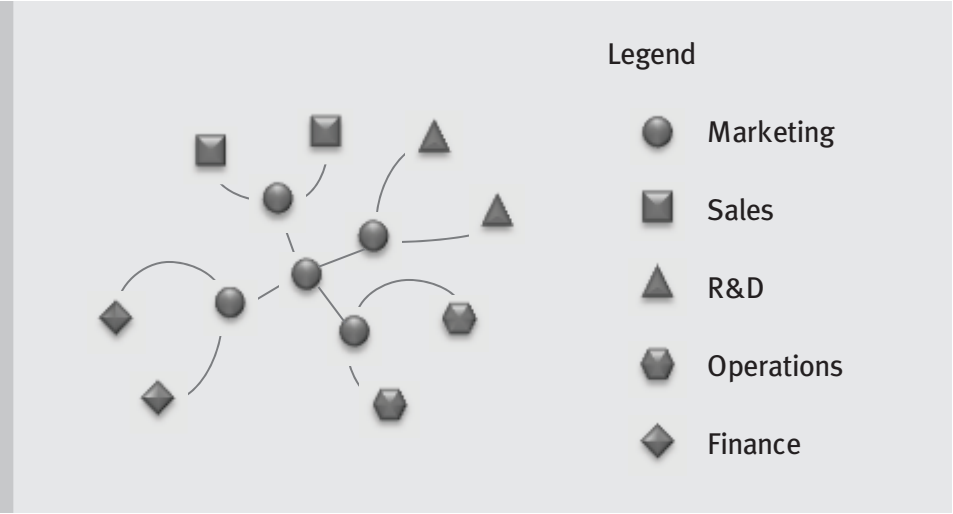

Figure 2. Network Optimized for Creativity

ONA is a methodology for mapping and analyzing these important informal relationships. As with many OD interventions, ONA begins with data collection. In the case of ONA, the data focuses on the pattern of communications and interactions between employees. Typically, the data is collected by surveying employees to understand who they communicate with most frequently about different topics (e.g., Who do you communicate with about new product and services ideas?). Alternatively, data can be collected through interviews, by observing interactions among employees, or by examining archival records of participation in project teams. Recently, some companies have sought to harvest organizational network data from electronic records such as email traffic. This approach has raised privacy concerns, however, and the data often lacks the context necessary for detailed analysis.

Once the ONA data is collected, software—such as UCINET, Pajek, SYNAPP—is used to map the network and analyze its characteristics. While appropriate network measures depend on the underlying purpose of the ONA, common network measures, include: density (i.e., the ratio of existing relationships to possible relationships), reciprocity (i.e., the degree to which relationships are reciprocated among individuals), and average distance (i.e., the average number of connections through which information must travel to traverse the network). Moreover, network analysis allows for evaluation not only at the organizational level but also at the individual level. For example, individuals may be characterized based on the role they play in the network: central players (i.e., someone with a great deal of connections who holds the network together); boundary spanners (i.e., someone who bridges two different parts of the network); or isolates (i.e., someone with few if any connections). The resulting network visualizations and analysis become the basis for findings and recommendations on improving organizational effectiveness.

Improving Innovation Capacity with ONA

One business application for which companies are increasingly using ONA is innovation. This is not surprising given that innovation is largely a network phenomenon (Rogers, 1995). Innovation is about integrating pieces of information from different areas to spark a new insight. According to Dr. Mike Addison, Section Head for Corporate R&D at Procter and Gamble, "Innovation is all about making new connections. Most breakthrough innovation is about combining knowledge in new ways or bringing an idea from one domain to another" (Dodgson, Gann, & Slater, 2006, p. 337). It is fair to say that the mythical ivory tower genius and her "Eureka" moment represent the start of a small fraction of new product and service innovations. Rather, the ideas that drive top line growth today depend on intense collaboration between and among diverse players. This environment is nearly impossible to assess using standard techniques, and it presents an ideal application for ONA.

When thinking about innovation from a network standpoint, it is useful to break innovation into its two component parts: creativity and execution (Dyer, Gregersen, & Christensen, 2009). Creativity is necessary to generate an innovative idea. Execution, on the other hand, is required to marshal and coordinate the resources necessary to bring that idea to market.

As it turns out, the structure of an organization's network has a significant impact on its ability to create and execute (Garcia, 2013). In fact, one of the things that make innovation difficult is that organizational networks optimized for creativity differ substantially from those optimized for execution. As a result, organizations tend to be good at either creativity or execution but not both.

Creative networks typically include many individuals with different perspectives who are only loosely connected to one another. For example, in *Figure 2* the structure of the relationships connecting members of the marketing team can best be described as a creative network. The marketing team has connections to many different perspectives, in this case different functions, but the marketing team itself is only sparsely connected. If you removed the single individual in the center, there would be no connections at all within the marketing team.

The diversity in creativity networks increases the likelihood that members will gain access to novel information and differing points of view with which they can formulate new ideas. Rogers explains,

> One's intimate friends are usually friends of each other's, forming a close-knit clique... Such an ingrown system is an extremely poor net in which to catch new information from one's environment. Much more useful as a channel for gaining such information are the individual's more distant (weaker) acquaintances; they are more likely to possess information that the individual does not already possess. (2003, p. 154)

Unlike creative networks, execution networks are made up predominantly of like-minded individuals who are tightly

connected to one another. As can be seen in *Figure 3*, the marketing team's network is now structured as an execution network. The group is tightly linked but has no connections outside of their own team. The common perspective and frequent interaction among members of execution networks means that they more easily align on direction, share a mutual language, understand each other's respective expertise, and have a high degree of trust (Garcia, 2007). These benefits translate into an ability to get things done. Everyone knows who needs to do what when and that they can count on each other to follow through.

Unfortunately, the very characteristics that make execution networks good at accomplishing goals limit their ability to generate new ideas. The lack of differing perspectives can result in groupthink and the dense connections can lead to an us-versus-them attitude in which transformative ideas are rejected as "not invented here." Likewise, networks optimized for creativity typically struggle at execution due to the lack of common understanding and lower trust, which inhibit the ability of participants to effectively collaborate.

The nature of creative and execution networks can be further illuminated with a description of the sales vs. headquarters paradox. This paradox is a common organizational phenomenon in which salespeople generate promising new product ideas but fail to convince headquarters to develop them. At the same time, while headquarters can get their own product ideas developed, their ideas are often sub-optimal. An examination of the typical sales and headquarter networks helps to explain this unfortunately all-too-common occurrence.

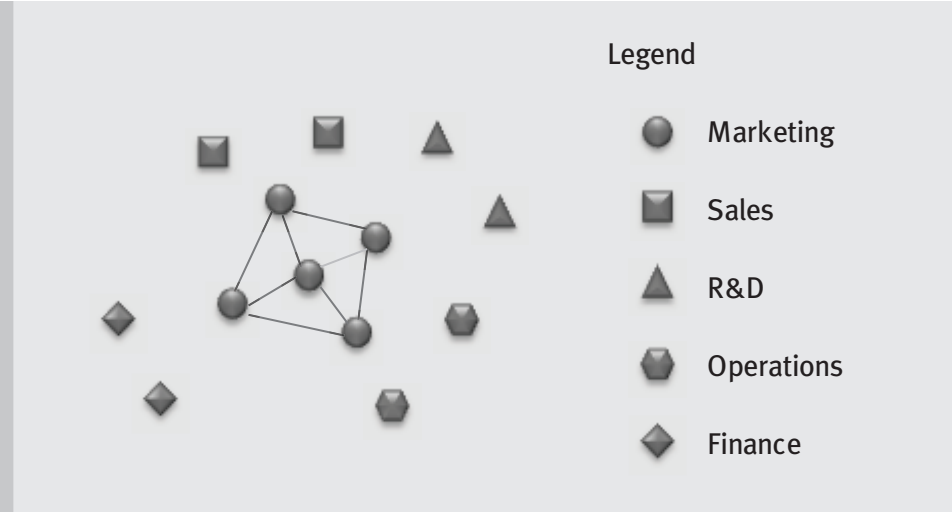

Figure 3. Network Optimized for Execution

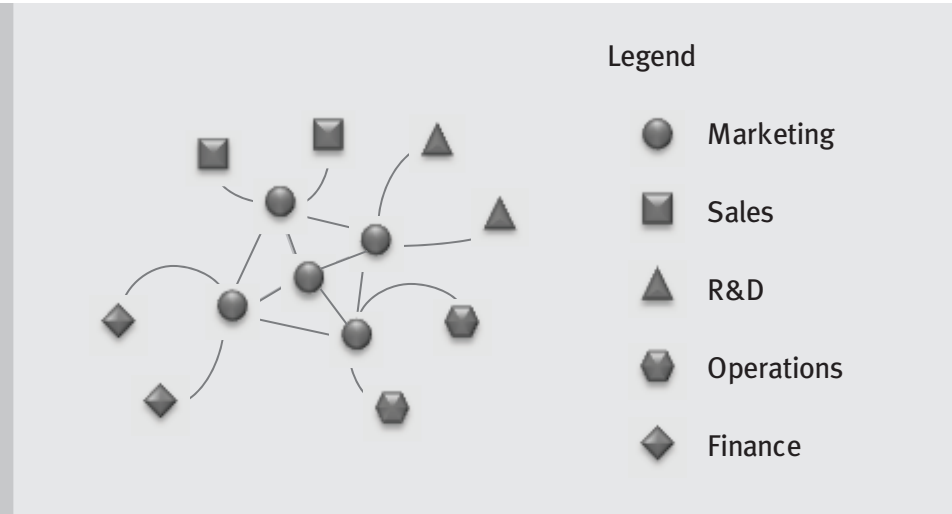

Figure 4. Network Optimized for Innovation (both Creativity and Execution)

In most companies, sales sits at the periphery of the organization's network. Sales associates are geographically dispersed and are as connected to external customers, suppliers, and even competitors as they are to members of their own organization. As a result, the sales function's network most closely resembles that of a creative network. Headquarters, meanwhile, is located at the core of the organization. Employees who work at headquarters see each other every day but less frequently speak with anyone in the field or outside their own company. Consequently, their network most resembles an execution network.

Ideally, an organization's network integrates the best attributes of both creative and execution networks. *Figure 4* depicts such a network. In this case, the marketing team's network tightly connects team members as well as provides access to multiple points of view. When this happens, the result is a true innovation network: one that can generate new, innovative ideas as

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well as coordinate resources and activities needed to bring them to market (Garcia, 2013). Such networks are characterized by a densely knit core of like-minded individuals, who also maintain numerous, non-redundant connections to individuals with diverse perspectives (see *Figure 4*).

Using ONA, OD practitioners can x-ray their organization to understand its current network structure and its resulting innovation strengths and weaknesses. *Figure 5* presents a matrix bounded by two axes: creativity and execution. Each quadrant represents a different type of network structure with different innovation capabilities.

Starting in the lower, left-hand corner of the matrix, organizations with a *Hesitating* structure are poorly suited to either creativity or execution. Their networks lack the diversity of perspective to come up with new ideas as well as the cohesion needed to execute. For this reason, organizations with *Hesitating* network structures are relatively rare; either they find a way to reconfigure themselves or they go out of business.

In contrast, most organizations adopt an *Exploring* or *Producing* network structure. Organizations with *Exploring* network structures are configured to come up with creative ideas but have difficulty commercializing them due to a lack of cohesion. Their new product history will likely be dotted with infrequent breakthrough products followed by long droughts. At the other end of the matrix, organizations with a *Producing* network structure are well suited to commercializing new products but lack diverse points of view. Networks in this quadrant efficiently turn out a series of uninspiring, "me too" products and services.

Ideally, organizations adopt an *Innovating* network structure. This network structure incorporates the best of both worlds: strong creativity and execution capabilities. Organizations with *Innovating* structures are better able to deliver a stream of original products and services that consistently generate strong margins and maintain category leadership.

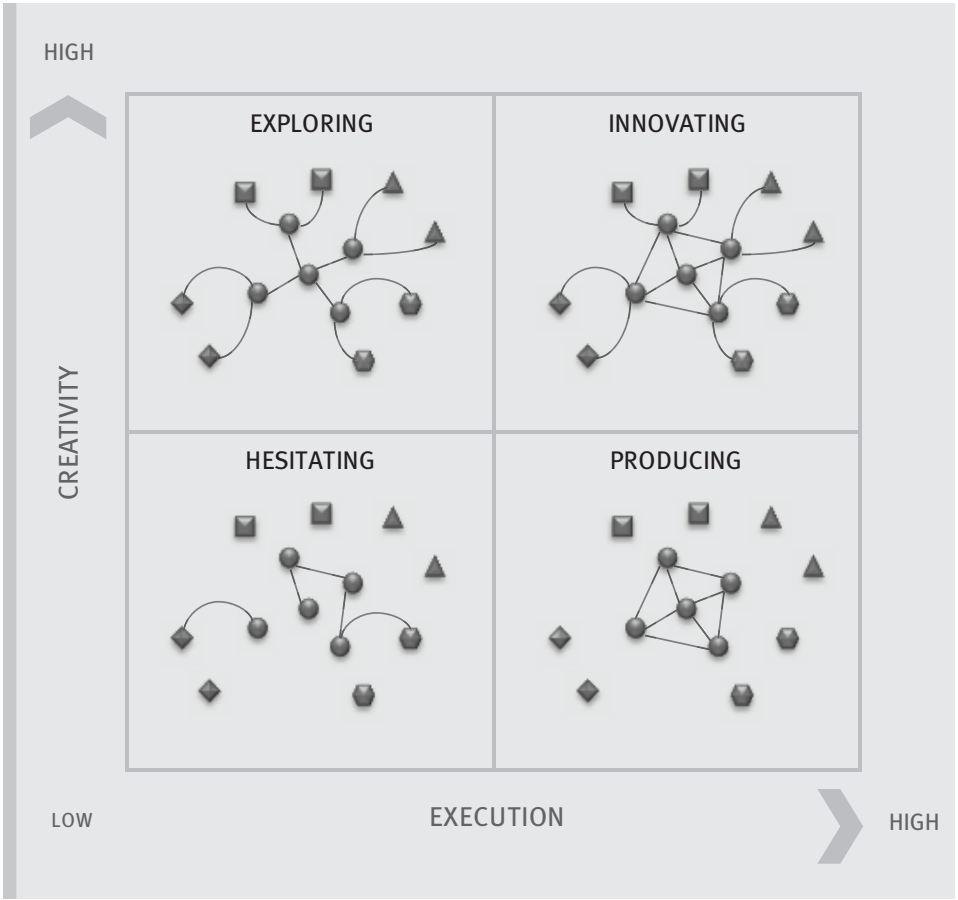

Figure 5. Network Structures and Innovation Capabilities

Case

The following case illustrates an example in which we used ONA to assess an organization's innovation capabilities and make recommendations for improvement. Recently, we were approached by the R&D leadership team of a global pharmaceutical company comprised of three separate divisions: pharmaceuticals, consumer healthcare and medical devices. The leadership team was aware of the successful innovations other organizations had brought to market by integrating the expertise of multiple, internal divisions (e.g., Philip's Ambilight, Pfizer's Listerine PocketPaks, and DuPont's SmartStrand Carpet) and sought to do the same. They viewed cross-divisional innovation as an untapped source of innovative ideas and wanted Wall Street to value the company as a synergistic whole versus the sum of three separate parts.

Up until that point, however, they had had little success; when they looked across the organization they could not find a single example in which multiple divisions, or business units, had worked together to develop a new product or service. Thus, they asked for our help in stimulating cross-division innovation.

In particular, our client perceived an opportunity to integrate their cross-division expertise in drug delivery—strategies and technologies for delivering medicine at the right dose, at the right time, and to the right place. As part of our engagement, we conducted an ONA among ~100 of the firm's R&D employees working most closely with drug delivery. Data on the frequency with which these employees communicated with one another about drug delivery as well as their mode of interaction was collected via a web-based, organizational network survey.

Analysis of the ONA survey data yielded several key insights. The first was that interaction between divisions was

quite low; less than 10% of communications regarding drug delivery between R&D employees crossed divisional-silos (see *Figure 6*). While surprising to leadership, this finding helped to explain the company's inability to develop cross-divisional products. Simply put, they were not talking to each other.

Second, we found that leaders communicated across divisions the least. Given that employees look to their leaders to model behaviors, leaders' failure to interact with colleagues outside of their own teams had a dampening effect on cross-division communication across the entire organization. Third, our ONA analysis revealed that certain divisions were better structured for innovation than were others. For example the structure of the Devices division could best be described as *Hesitating* while the Rx division's network adopted an *Innovating* network structure.

Our findings benefited the client in several ways. Visualizations of the network maps illustrated the lack of cross-division communication, and, in particular, leaders' lack of communications outside their own divisions. In and of themselves, these visualizations generated motivation for change. For the first time, employees and leaders were confronted with quantitative data demonstrating the need for greater cross-division collaboration. In addition, the analysis provided a benchmark our client could use to measure collaboration progress moving forward.

The analysis also allowed us to develop specific recommendations for improvement. Recognizing that a key obstacle to cross-division innovation was a lack of communication, we determined the need to develop specific cross-division innovation goals, clearly communicate those goals across the organization, increase opportunities for employees from across the organization to meet and interact (e.g., project teams, forums, etc.), and establish metrics with which to measure success and hold leaders accountable. In addition, through an analysis of our ONA data, we were able to pinpoint specific individuals who, based on their existing connections, were best positioned to forge new relationships across divisions.

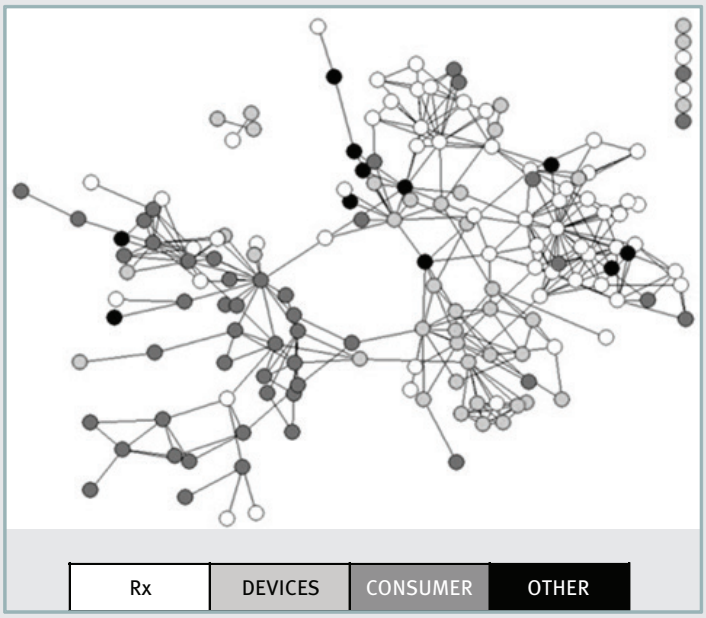

Figure 6. Client's R&D Drug Delivery Innovation Network

Finally, the ONA findings informed the design of and selection of participants for a 3-day, large-group intervention in which we brought together members of all three divisions. This large-group intervention served two purposes. First, it provided an opportunity for participants to share their existing drug delivery work and collaborate to come up with ideas for new cross-division drug delivery products. All and all, the session generated over 100 new product ideas which participants prioritized to come up with a subset to pursue. Second, the large-group intervention served as a means to forge new cross-division relationships that would persist beyond the end of the 3 days. By bringing participants into the same space at the same time and showing them what they have in common, the session acted as a catalyst for the creation of new cross-division relationships.

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Conclusion

ONA provides a new, powerful lens through which to assess innovation within organizations. Innovation is a complex, challenging process requiring that groups work together to solve problems and make decisions across functions, geographies, and divisions. ONA's ability to map and analyze human systems makes it particularly fitting to the task.

Moreover, OD professionals are ideally suited to leverage ONA to improve innovation within organizations. Their integrated understanding of formal and informal systems and processes as well as their focus on people uniquely positions them for this work. In addition, until recently ONA resided largely in the domain of academics who struggled to translate findings about network "density" or "centrality" into terms that resonate with pragmatic business leaders. OD practitioners' emphasis on organizational effectiveness and performance provides them with an understanding of business leaders' priorities and a shared language with which to communicate and influence. Finally, network analysis introduces important ethical considerations. For instance, unlike typical survey methods, ONA does not allow for respondent anonymity. For the data to be useful, the people analyzing the data must know respondents' identities (Borgatti & Molina, 2003). OD's grounding in a distinct set of core values, including a commitment to help everyone within the organization to increase autonomy and empowerment, provides some safeguards against potential abuses.

For too long, OD practitioners have sat on the sidelines of a conversation that CEOs maintain is at the heart of their growth strategies. ONA provides a means for OD professionals to not only participate in the innovation discussion but to lead the way.

Stephen Garcia, PhD, is a Partner at Philosophy IB, a management consulting firm that achieves meaningful and sustainable performance improvements by bringing client's innovative, bold strategies to life. Stephen earned his MBA from the University of Virginia's Darden School of Business and his Doctorate of Education from North Carolina State University where his research focused on how organizational networks affect learning, change, and innovation. He can be reached at *stephen.garcia@philosophyib.com*

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