SYMPOSIUM

HUMAN CAPITAL, SOCIAL CAPITAL, AND SOCIAL NETWORK ANALYSIS: IMPLICATIONS FOR STRATEGIC HUMAN RESOURCE MANAGEMENT

JOHN R. HOLLENBECK
BRADLEY B. JAMIESON
Michigan State University

Human resource management research has traditionally taken the attribute approach; outcomes are considered to be dependent on attributes of the individuals or attributes of the job itself. However, many of the phenomena and outcomes related to human capital, such as recruiting and onboarding, teamwork and communication, knowledge management, and employee satisfaction are also dependent on social capital and the relational networks that exist among employees. Social network analysis is a methodology that has so far been underutilized within the human capital field, but it is uniquely suited for helping researchers and practitioners understand the complex relationships that are driving organizations. This article provides an introduction to social network analysis and explains how it can be applied to both research and practice, with the goal of developing new ways of thinking about human capital, social capital, and the important interaction between the two.

Imagine a traditional workplace survey designed to determine how satisfied employees are with communication. It might ask straightforward questions, such as “How often do you communicate with your coworkers?” or “Are you satisfied with the level of communication with your coworkers?” If the results are positive, it might be assumed that inter-employee communication is going well, and that would be the end of the story. Is it possible, however, that these kinds of traditional surveys and analyses may be missing part of the story? Take the case in which one formal group of employees never interacts with members of a separate interdependent formal unit but has a great deal of interaction among its own members. In another unit communication within the unit is nonexistent, but members communicate frequently with members of other units. These are two clearly distinct patterns of behavior that could lead to very different group or organizational outcomes, yet traditional surveys may produce very similar-looking results.

As another example, even though all the employees may feel satisfied with the amount of communication, this might result from a situation where the channels of communication are redundant and inefficient. For example, in one unit a manager may individually communicate the same message to 20 employees, while in another unit the manager may communicate with only one or two well-connected group members who then relay the information with little or no decay to the rest of the unit. In both cases there are open lines of communication that could produce similar-looking survey results, but again, these are two very different network patterns, and one is much more efficient than the other. These two examples illustrate what might be missed by studying individual perceptions of communication satisfaction rather than the larger relational social networks in which individuals are embedded.

Traditional research and practice in the area of human capital management have been dominated by frameworks that focus primarily on individual attributes, job attributes, or their interaction (Borgatti & Li, 2009). That is, important outcomes such as job performance and voluntary turnover are viewed as
being caused by personal attributes such as conscientiousness and cognitive ability (Dudley, Orvis, Lebiecki, & Cortina, 2006; Van Iddekinge & Ployhart, 2008) or job characteristics such as autonomy and social impact (Grant, 2007; Morgeson, Delaney-Klinger, & Hemingway, 2005). This conceptual framing has had a great deal of value and has generated a number of excellent interventions that leverage personnel selection techniques, training programs, job redesign efforts, and compensation plans that promote internal and external equity (Wright, Gardner, Moynihan, & Allen, 2005).

Without question, this focus on the attributes of the individual and the job has been productive; however, this approach neglects other critical aspects of organizational behavior and drivers of practical outcomes at work. As organizations are becoming increasingly structured around teams (Ilgen, Hollenbeck, Johnson, & Jundt, 2005), this focus has precluded a deep examination of how human resource management research and practice could be furthered by studying attributes of the relationships between individuals or jobs. Few would argue against the notions that modern organizations are social entities and that these entities can be decomposed into social networks of individuals and subgroups, but this perspective has not played a large role in human capital management research or practice to date. This omission is important because the result of losing someone central to an organization’s informal network will be much more detrimental than losing someone on the fringe, even if one holds the attributes of individuals and jobs constant. Similarly, adding a new employee who links two or three previously unlinked units can create synergistic value far beyond what one might predict simply from the individual’s attributes or the job description. Thus, although marginal gains may be accomplished by a continued emphasis on the attributes of individuals and jobs, more substantial gains could be achieved by tapping into unrealized opportunities for framing human capital management and practice around the attributes of relational network properties (Kilduff & Brass, 2010).

Within the larger realm of the social sciences, there has been a resurgence of interest in relational networks (Borgatti & Li, 2009; Borgatti, Mehra, Brass, & Labianca, 2009). Some of this can be attributed to improved modern methods for capturing and analyzing network data. In particular, social metrics that arise naturally from digital traces and sociometric sensors have created databases that were not conceivable even 20 years ago (Kim, McFee, Olguin, Waber, & Pentland, 2012). When this is combined with the availability of increased computing power for analyzing this type of big data, the opportunities for leveraging data on social networks are unprecedented. Accordingly, social network analysis is gaining a foothold in the management literature, and researchers are beginning to explore how organizational network ties are formed and how these ties affect other organizational outcomes.

To a large extent, however, this approach has not had as much effect on research or practice in the field of human capital management. Therefore, the purpose of this paper is to show why social network analysis should be leveraged in this area of management—and how it could be. It seems appropriate to use this special issue of Academy of Management Perspectives, created specifically to change the way researchers and practitioners think about human capital, to discuss the merits of social network analysis as a means of assessing the role of social capital, which can be a unique complement to human capital. Although one might think that this is simply a data analytic technique, in fact the inputs required to conduct such an analysis, the decisions one makes about how to process these inputs, and the resulting outputs that emerge from this analysis all force one to ask new questions and come to grips with new answers.

We hope that this article will stimulate new lines of thinking and streams of research that provide novel insights into the role of social capital as a force that may accentuate or neutralize the common effects attributable to human capital. By examining human capital from this new social perspective, human capital managers may be able to make better-informed decisions about their personnel and create more efficient work systems and teams. In addition, by highlighting some of the possible research opportunities around social network analysis in the human capital domain, we can draw the attention of researchers from other fields and expand the general interest in human capital. This could generate a richer, more diverse knowledge pool, ultimately leading to a better understanding of human capital and more effective human resource management practices.

This article consists of three main sections. First, we provide a brief history of social network analysis and review some of the ways this technique has been used in other disciplines and within the management field particularly. We then introduce some of the key terms used in social network
analysis and highlight some of the key inputs and outputs that might be especially relevant to those responsible for managing the human resources function within a large organization. The final section focuses on specific ways in which organizations can use social network analysis to further improve their understanding of their organizational networks and how this information might be used to improve outcomes for individuals, teams, and organizations.

PRIOR APPLICATIONS OF SOCIAL NETWORK ANALYSIS IN RESEARCH

In the most general sense, social network analysis has been defined as the study of sets of actors and the relations that connect and divide them (Freeman, 2004). Social network analysis can trace its roots to the work of psychiatrist Jacob Levy Moreno (Wasserman & Faust, 1994), whose 1934 book *Who Shall Survive?* introduced the concept of sociometry, the mathematical study of psychological properties of populations. Moreno was attempting to explain a sudden increase in runaways from a girls reformatory school in Hudson, New York. His analysis revealed that the ability to predict who would run away had very little to do with individual traits and attributes of the girls, but instead was strongly determined by the relational ties and cliques among the girls (Borgatti et al., 2009). By mapping the social network of the school, Moreno was able to see the channels of social influence and the flow of ideas between the girls, which offered a better understanding of the social influences that were causing certain girls to run away. From this starting point, researchers and scientists developed the methodologies and terminology necessary for more robust quantitative analyses, which turned into what is now known as social network analysis.

The recent growth of social network analysis in research and science can be seen quite clearly by looking at the number of published articles containing the phrase “social network analysis.” According to the Web of Science, a citation indexing service and means of searching for scholarly articles, at the time of writing there were more than 2,500 peer-reviewed scientific articles that mentioned social network analysis. The first use of the phrase occurred in the early 1970s, but more than 1,600 (65%) of these articles have been published in the past four years. This exponential growth illustrates the acceptance of social network analysis by the scientific and academic communities as a legitimate and useful way of understanding networks, organizations, and phenomena. Also, as noted earlier, it is due in part to the increased ease of capturing and analyzing very large volumes of relational data (Burt, Kilduff, & Tasselli, 2013).

As the social network perspective has grown in popularity, it is no surprise that management researchers have found ways to incorporate it into their work. In an article similar in nature to this one, Borgatti and Li (2009) highlighted the various ways that social network analysis could be applied to a supply chain context. Giuliani and Bell (2005) looked at networks within the Chilean wine industry to study organizational knowledge sharing, clustering, and innovation. Cárcamo, Garay-Flühmann, and Gaymer (2014) similarly looked at the inter-organization relationships in the management and governance of coastal marine ecosystems; the collaboration and knowledge sharing necessary among a network of government agencies, marine organizations, the fishing industry, and universities made social network analysis uniquely appropriate to understanding the interplay of the organizations and their roles in the system. Monaghan, Gunnigle, and Lavelle (2014) used organizational network ties to explain the success of certain firms entering into foreign markets based on their communication of resources, development of business relationships, and access to tacit knowledge based on network ties.

Social networks have also been used to explain the movement of knowledge among individuals and even the movement of workers themselves. Casper (2007) was able to track the mobility of laborers and managers within the San Diego biotechnology industry and map the emergence of sustainable technology clusters by studying social network formation. Breschi and Lissoni (2009) also used social network analysis tools to map the geographic dispersion of highly skilled workers in the biotech industry and study localized knowledge flows and invention clusters and their impact on patent citations. More recently, Morandin and Bergami (2014) used network analysis methodology to map sense-making and decision-making patterns in recently hired call center employees.

All of these management research studies highlight two important facts. First, the network and relational perspective is able to explain organizational outcomes that would not be fully understood through traditional research methods or conceptual frameworks that only consider human attributes. Second, organizations that understand their position...
in an organizational network or that understand the social network of their employees will have a unique perspective compared to their competitors and can use this knowledge to gain a practical competitive advantage.

**THE BASICS OF SOCIAL NETWORK ANALYSIS**

Modern social network analysis is an amalgam of terms and methods developed over the past 80 years by many individuals across a wide spectrum of sciences. However, the Wasserman and Faust (1994) text *Social Network Analysis: Methods and Applications* serves as a suitable summation of the social network approach, and is often cited for providing the definitions of network terminology and validation for the use of certain methodologies. As such, it is an appropriate starting point for introducing some key terms and the basics of social network analysis.

To contextualize this information for the human resource management context, we will illustrate the concepts as they might be understood by a newly hired chief human resource officer (CHRO) who, upon arriving at his or her new job on the first day, is handed a traditional organizational chart. Figure 1 shows a portion of this chart for one division of the company, which for elucidation purposes we will assume comprises six subunits (or teams) of similar size and structure. This formal chart would be accompanied by a set of formal job descriptions for each person that we will assume is up to date. The CHRO would also be given attribute information on each job incumbent in the form of demographic characteristics, experience-related information, and scores on a battery of cognitive ability tests and personality inventories. This would be a common starting point for a CHRO whose organization takes an attribute approach to managing the human capital management function and is accustomed to understanding human capital in attribute terms rather than relational terms.

Now beyond this, imagine a scenario where this CHRO is also handed one additional chart, such as that depicted in Figure 2. This figure shows an accurate depiction of the social network that corresponds to the within-division ties in the division depicted in Figure 1. The machine-like, man-made, top-down, symmetrical nature of the structure depicted in Figure 1 stands in sharp contrast to the organic, emergent, bottom-up, asymmetrical structure shown in Figure 2. This figure could be augmented by a hypothetical Figure 3 (not depicted here) that might show the organization-wide ties for each person, where the organization as a whole is composed of five additional identically sized and structured divisions. Figure 3 would be quite large in the sense that it might depict 252 people (6 × 42) outside the top management team. This could also be augmented by hypothetical Figure 4 that might take Figure 3 and simply plot the ties for the 36 units within and between the six divisions, creating a group-level analog to Figure 2. Finally, this might be even further augmented by a hypothetical Figure 5 that would depict the external ties among individuals within the organization (or units) and individuals (or units) outside the organization. Due to space limitations, we do not produce Figure 3 through Figure 5 here, but we will occasionally make reference to these hypothetical figures.

With these figures in mind, the question becomes this: What useful information is available to the CHRO from Figures 2 through 5 that is not available from Figure 1 alone? We will use this question and Figure 2 to describe the logic, the basic elements, and the core constructs within the field of social network analysis and how they might manifest themselves in the context in which this CHRO operates.

**Actor**

The most basic unit in a network is an actor. In Figure 2, this is operationalized at the individual
level and depicted as a colored circle for frontline employees and a diamond for division managers. As we noted, there are 42 individual actors depicted in this particular division of this organization. We use color to represent units, the number 0 to reflect supervisory status, and the numbers 1 through 6 to reflect the relative rank of each member in the unit in terms of tenure, with 1 representing longer tenure.

**Relational Tie**

The social link between actors is referred to as a relational tie; these are indicated in Figures 1 and 2 by lines. For example, the link between individual R1 and R0 in Figure 2 indicates that they frequently communicate with each other. Relational ties can come in many forms and are dependent on the interests of the researcher or practitioner. Relational ties could simply reflect that one actor communicates with another actor at some level of frequency or intensity, or a tie could reflect a relationship that has some affective value, such as friendship. Clearly, a friendship tie is qualitatively different than a communication tie, and thus the precise nature of the tie is often important for understanding the meaning of a network such as that depicted in Figure 2.

Ties can come about in a number of different ways, but when it comes to communication ties, these links are often “appropriable.” This simply means that ties may come about for nonwork reasons (employees who are tied to each other because they play in the same bowling league or belong to the same country club) but can often serve work-related functions. That is, if two people who work in the same organization spend a great deal of time together outside the organization, it might be only a matter of time until topics involving work come up. This is especially the case if these ties are closed, as we will discuss more fully below.

The appropriability of ties also has implications for answering the question of who appropriates value from such ties. Some of the value might accrue to the organization or the individual, or the dyad or closed triads or small subgroups, and all of this depends on who manages these ties and toward what end. If the organization hopes to derive value from these ties, at the very least, some degree of awareness is essential for accomplishing this goal.
Thus, a CHRO who is unaware of the information provided in Figure 2 would be in a much weaker position to leverage these kinds of social ties than a CHRO who is in possession of this kind of information.

There are several ways of measuring relational ties. The simplest is a dichotomous value, usually a 0 indicating that no relational tie exists or a 1 indicating that there is a relational tie between the actors. More refined continuous measures can also be employed, but we will keep it simple here by focusing on dichotomous ties that do not vary by strength. In addition, ties can be directional or nondirectional. For example, if one person communicates with another person, a nondirectional communication tie exists between them. However, if we look more closely, if one person is always giving advice and another person is always seeking advice, their communication tie is directional. Again, for our purposes, we will focus on nondirectional ties.

**Dyad**

A relational tie between two actors forms a dyad. These dyads form the base of the relational perspective inherent in social network analysis. Any relational tie is the property of the pair, not a trait or characteristic of a single actor. For example, the leader of a small work group such as R0 may have a relational tie with each member in that group, forming multiple dyads. If the CHRO is interested in communication between the leader and group members, it is possible that the leader communicates differently with each member, and so each dyad would have a different communication score if a continuous measure is employed. Within a dyad, one of the focal actors can be referred to as the “ego,” or rater, and the other actor would be the “alter,” or the rated.

**Triad**

Triads are formed by adding a third actor to the relationship being studied, and they can take different forms. A third-party brokerage relationship exists when an actor serves as the link between two actors who are not otherwise linked. This is also called an open triad. Third-party brokerage relationships rely on external personnel for knowledge transfer, and so they tend to suffer from information loss due to the involvement of an intermediary who might not be intimately familiar with the domains associated with the other two actors. For example, in Figure 2, G6 and O5 do not communicate with each other directly, but G5 serves as an intermediating link between these otherwise unrelated individuals. This third-party relationship is nonredundant in the sense that there is no other way for G6 and O5 to communicate. This situation differs a great deal from the third-party ties associated with the link between G4 and O4. Again, G4 and O4 are not directly linked, but there are two paths for G4 to communicate with O4. He or she can go through Y3 or Y4, and hence these paths are redundant. A third-party broker is more powerful and has greater social capital when he or she is part of a nonredundant relationship than when he or she is part of a redundant relationship.

A closed triad exists when all three members of the triad are related. This is sometimes referred to as a Simmelian triad (Krackhardt, 1999), because Georg Simmel argued that the quality of a direct tie between two individuals changes in the presence of a third partner. A third-party tie serves to (1) constrain individual interests in favor of collective interests (i.e., an individual can be outvoted by the others), (2) curb individual bargaining power (i.e., the threat of withdrawal carries less weight), and (3) prevent conflict escalation (i.e., third-party mediation is available).

Thus, compared to simple dyads or open triads, Simmelian triadic relationships are characterized by reduced individuality, reduced individual power, and mediated conflict. This suggests that an individual who is part of this type of three-person informal group is more constrained and less independent than an individual in an isolated dyadic relationship. For example, the relationship between O0 and O5 is a vertical dyadic relationship between a formal supervisor and a new, low-tenured group member. O0 and O5, however, both have close relationships to O3, a longer-tenured group member. The relationship between O0 and O5 is affected by their joint relationship to O3, and thus, if one tried to infer the nature of the relationship between O0 and O5 based solely on their individual attributes and job descriptions, one would be making a very large mistake. A true understanding of this relationship can be ascertained only by appreciating the nature of this third-party relationship.

**Subgroups and Fault Lines**

Although units are typically viewed as holistic constructs, especially when moving from the individual
level to the group level, as we might do when moving from Figure 2 to hypothetical Figure 4, in fact there can be a great deal of variability within units that may be lost upon aggregation. That is, it is possible that identifiable subgroups will form within units. For example, in Unit V, there are two definable subgroups: V1, V3, and V5 versus V2, V4, and V6. One can also see that the V2/V4/V6 subgroup is strongly tied to the supervisor V0 (the in-group) but that this is not the case for V1/V3/V5 (the out-group).

There are two special cases of subgroups that are worth mentioning. First, a subgroup might form around a demographic fault line. Similar to Unit V, there are also two subgroups within Unit O in Figure 2. However, in this case the subgroups are based on a demographic characteristic. That is, as indicated by the asterisks, the subgroup O2/O4/O6 comprises members of some demographic group defined as a protected class by the Civil Rights Act of 1964 (e.g., African Americans). Like the distinction between an open and a closed triad, the distinction between a subgroup caused by a demographic fault line and one that might emerge for some other more innocuous reason (avid sports fans in the group versus those who appreciate the fine arts) can have meaningful implications within the context of human capital management.

The other special case is a subgroup that is defined by a single member. In Unit Y, all the team members are close to one another with the exception of Y4, who is an isolate within this unit. If one had a figure that captured interdivisional or interorganizational linkages as we described in hypothetical Figures 3 and 5, we might see that Y4 is a cosmopolitan figure, with strong ties outside the division or organization but very weak ties within the division. If this were the case, the value that this person might bring to the unit because of his or her extra-organizational ties may not be understood by the organization using traditional organizational charts. Alternatively, Y4, who is low tenured, may have been brought into the group recently to add some skill or knowledge base that was not previously represented in the unit. If this is the case, one can see how hiring a skill and integrating the skill within current operations are two very different things.

Individual B6 is also an isolate in this organization, but in addition, he or she is a new hire and a member of a protected group. Any effort that someone in the human capital management group makes to help create a tie between this individual and his or her own group or the subgroup O2/O4/O6 might make the difference between retention and turnover for this person. For reasons described below, there may also be value in creating a tie between this person and R1. In general, Figure 2 shows that, except for the highly cohesive Unit R, low-tenured members in this division are not tightly integrated into many networks. This might point to the need for stronger socialization programs.

**Formal and Informal Groups**

The formal group is the finite collection of all the actors that make up a unit according to the organizational chart and written job descriptions. Thus, R is a formal unit comprising members R0 through R6. As we noted above, this is also a very cohesive group, in the sense that all members within the group are strongly tied to others within their own group, even recent hires such as R6. This is often referred to in social network terminology as closure. In contrast, G is also a formal unit, but the within-team ties in this group are very weak. However, what members of Unit G lack in within-team ties is offset by their strong ties to members of other units. Many members of Unit G occupy “structural holes” and serve as the only informal link between otherwise disconnected units.

In contrast, Unit R has very weak between-team ties. Strong ties within the unit provide some advantages to Unit R in terms of developing and monitoring norms, as well as promoting efficient within-team coordination. This comes at the cost of acquiring new and novel information that could be obtained with increased ties to individuals outside of the group. On the other hand, Unit G may be filled with individuals who have new and unique information, but the unit may struggle with the process of translating this information into practical outcomes due to conflict and coordination problems. Understanding the nature of the formal and informal relational ties both within and between units will help organizations identify and solve problems related to various social structures.

There is one member within Unit R who is linked to individuals outside the group, however, and this is R1. In fact, Figure 2 shows that R1 is strongly linked to O1, Y1, G1, B1, and V1, and together this collection of individuals defines an informal group that in this context might be very powerful due to their seniority. That is, this informal group has a great deal of experience and implicit knowledge, and in most cases, they are also strongly connected to their own individual units. For our new CHRO,
the ability to tap into this network might go a long way toward speeding the integration process, and in terms of reaching some organizational members there may even be more value here than attempting to move through formal channels.

For example, although the formal supervisors in Units R, O, and Y are closely tied to their teams, the formal leaders of Units G, B, and V are less strongly tied to their teams, and instead are tied closely to only their most tenured members. In this instance, one might be tempted to follow up formal communication attempts from the top management team to the teams themselves with some informal communications that proceed via the R1/O1/Y1/G1/B1/V1 route. Clearly, one would not want to subvert the formal structure by totally bypassing formal channels. However, for critical information, prudence dictates that one might want to cover all the bases by moving information through multiple channels—especially channels as efficient as R1/O1/Y1/G1/B1/V1. This might be especially true when the formal channels seem weak, as in the case of B0 and V0. It is one thing to support the formal network and help strengthen it, but quite another to simply assume it is strong because of the lines one sees on the formal organizational chart.

Finally, although it is quite easy to understand how the informal group R1/O1/Y1/G1/B1/V1 came about, the nature of other informal groups is sometimes harder to understand. For example, there is also a strong informal group defined by O1/Y0/G4/B3/V2. Some due diligence might reveal that this is a group whose children all play on the same high school athletic team, and who spend a great deal of time together outside of work traveling to and attending such events. This takes us back to the notion of appropriability of ties, in the sense that the subgroup G4/B3/V2 is much more connected within this division than one might surmise just from looking at the organization chart. This subgroup has excellent access to both Y0 and O1, who for both formal and informal reasons are very central to this division when it is conceptualized in relational terms.

Centrality

One of the uses of social network analysis is to determine the most important actors within a network. For example, as we mentioned above, O1 is a central actor within this division. Although everyone within the R1/O1/Y1/G1/B1/V1 informal subgroup has some importance, O1 is particularly central because as we have shown, he or she is also part of the O1/Y0/G4/B3/V2 informal subgroup. Importance, or synonymously prominence, has typically been measured through centrality. Centrality is mainly concerned with an actor’s activity within the network, and one operationalization of this is called “degree centrality.” Degree centrality is a proportional measure of the number of direct ties an actor has out of the total number of possible ties.

In Figure 2, Y1 is immediately connected to 11 other actors, meaning that he or she has a relatively high degree centrality score within this network. However, actor Y4 has only three direct relationships, indicating that he is less active in this particular network, which would be quantified through his lower degree centrality score. An actor with a high degree centrality score is often “a major channel of relational information” and “a crucial cog in the network” (Wasserman & Faust, 1994, p. 179). This important information could not be gleaned strictly from the formal organizational structure.

Summary

Although Figure 1 would certainly be required for our newly hired CHRO, as one can see from the discussion above, given the opportunity, the CHRO would undoubtedly find value in being able to supplement Figure 1 with the information in Figure 2. He or she might even find it worth the effort to generate Figures 3 through 5 as well. Certainly if our CHRO is accustomed to having this relational information from previous appointments, he or she might perceive himself or herself as “flying blind” in his or her new post if provided with only attribute information about the actors and their formal job descriptions.

THE POTENTIAL ROLE OF SOCIAL NETWORK ANALYSIS IN HUMAN RESOURCE MANAGEMENT

When considering the introduction of a new methodology or theory in research, it is important to ask this question: What can this new approach help us explain that we were not able to explain before? As we seek to bring new practices into organizations we must ask a similar question: What can the new approach help us accomplish, and what value does it bring to organizations above and beyond the traditional and already established practices?
With these goals in mind, we now explore the potential uses of social network analysis in the domain of human capital. Our focus here is how companies can use this technique to gain a better appreciation of their social networks, and then leverage this information to promote better decision making and understanding of the effects of certain policies and practices. While our focus is more practical, we hope the topics and ideas presented will also provide management researchers with a new perspective on how their work could be approached.

We do not mean to imply that social network analysis should replace the individual-attribute approach to human capital. Attributes are still important within the social network because research shows that certain people can take better advantage of their superior structural situation than others can (Kilduff & Brass, 2010), and few scholars within the field of social network analysis embrace pure structural determinism. However, social network analysis is a useful supplement to current methods and the attribute approach, and it may help explain or control some aspect of human capital that is not yet fully understood. In the following sections we discuss the potential for social network analysis in terms of (1) the acquisition and preparation of human capital, (2) the assessment and development of human capital, and (3) the compensation and retention of human capital.

The Acquisition and Preparation of Human Capital

An important role of the human resource management team in any organization is identifying, selecting, and recruiting employees. Recent research has found that highly productive employees are rarer and harder to find than originally thought (O’Boyle & Aguinis, 2012). Therefore, companies that develop valid measures for predicting future performance will have a strategic advantage over their competitors. In particular, as companies continue shifting toward team-based structures and compete through improved knowledge management systems (Zárraga & Bonache, 2003), it will be critical to understand what kinds of employees help maximize team potential and the flow of knowledge through the organization.

Using social network analysis, organizations can pinpoint which employees are best at developing strong, trusting relationships, which is a factor critical to success both within teams (De Jong & Elfring, 2010) and between teams (Hinds & Cramton, 2014). As for knowledge networks, it is important that organizations know who influences the spread of information and who serves the important brokerage roles across structural holes (i.e., linking otherwise disconnected subgroups) (Hansen, Mors, & Lovas, 2005). Organizations can use social network analysis to determine which employees are most critical to their network; determine what skills, experiences, and traits these critical employees possess; and then hire future employees accordingly, providing improvements to both concurrent and predictive validation selection processes. The knowledge gained from understanding the network ties among employees will allow selection departments to test potential applicants with more accurate and valid measures, leading to the acquisition of more highly productive employees within team- and knowledge-based systems.

However, before companies can test applicants for fit, they have to find the applicants. As noted previously, researchers have already used social network methods focused on extra-organizational ties (like those that would have been depicted in hypothetical Figure 5) to identify talent pools outside the organization and track the movement of highly skilled workers (Breschi & Lissoni, 2009; Casper, 2007). If companies are able to develop similarly sophisticated network capabilities, they could begin to identify regions filled with talented workers or universities and other recruitment sources with track records of producing valuable employees.

Employee referrals and word-of-mouth recruiting (Van Hoye & Lievens, 2009) have traditionally been used for recruiting purposes, but social network analysis takes these recruiting approaches to a new level. Current employees already have firsthand knowledge of the company and specific job requirements and so they are particularly well suited for identifying other individuals who might be a good fit with the organization and for championing the benefits of the company to these potential applicants. However, most employees have a very weak understanding of other people’s ties, and thus, the ability to triangulate on a specific recruit or source of recruits is easier to accomplish with social network data in hand. By formalizing some of the practices already in use, social network mapping can help tap into the external networks of employees to identify potentially underutilized talent pools and more successfully exploit known pools.

As new employees are brought into organizations, human capital managers should ensure that they are...
properly trained to do their jobs and assist in onboarding (i.e., helping new hires adjust to social and performance aspects of their new jobs) (Snell, 2006). The types and strengths of relationships new employees form have a significant effect on the outcomes of both of those functions. Research has shown that employees who fail to form meaningful relationships with their coworkers and supervisors typically have lower job satisfaction, possibly leading to higher intention to change jobs (Eisenberger, Stinglhamber, Vandenberghhe, Sucharski, & Rhoades, 2002).

Work norms and expectations are often shared as tacit knowledge transferred through relational ties and knowledge sharing (Nonaka & von Krogh, 2009). If new employees fail to integrate, they could also fail to adapt to the department or organization culture, further isolating them and negatively affecting their performance. Social network analysis can help organizations overcome these problems in a number of ways. First, it allows companies to identify the “social butterflies” in the network and use these individuals as liaisons to help facilitate the socialization process. Second, it can help identify employees who seem socially isolated and allow the organization to focus social interventions in the right areas. Over time, the organization can monitor the formation and development of network ties, which can help human capital managers determine the effectiveness of their onboarding and knowledge management practices.

Finally, another human capital issue relevant to many companies operating in today’s global environment is how to select and prepare expatriate workers (Takeuchi, Tesluk, Yun, & Lepak, 2005). Living and working overseas offers many unique challenges and can be difficult for employees who are not set up to succeed. One of the ways companies can help their expatriates succeed is by ensuring that there is an established social network for them to join in their new locale. They need individuals who can help them understand and adapt to local customs and expectations and a support group to share ideas and concerns with, possibly involving peers who have already been through similar experiences. Also, the well-being and social life of spouses or significant others must be considered, as their happiness and acclimation can have a significant effect on an employee’s happiness and success. Additionally, from a business standpoint, as highlighted by Monaghan et al. (2014), having a proper network in place is important to successful entry into a foreign market.

Social network mapping could allow companies to see what resources are in place and what types of relationships may need to be established to allow their expatriates and overseas operations the greatest chance of success.

The Assessment and Development of Human Capital

Assessing and developing human capital is a central goal for all organizations. Research has shown that effective learning systems involve both formal learning (e.g., class sessions) and informal learning (e.g., the exchange of information by individuals) (Galagan, 2010; Roy, 2010). Training interventions will be more effective if employees have a training support network within which they can discuss their newly acquired knowledge and have a social environment in which they feel comfortable trying out their new skills (Parry, Friedman, Jones, & Peternity, 1990). In line with this idea, Zohar and Tenne-Gazit (2008) found via social network analysis that infantry soldiers with strong friendship ties were more likely to reach a consensus regarding platoon safety expectations. Similarly, Meyer (1994) found that group cohesiveness as measured by strong relationship ties was associated with similar perceptions of organizational standards and expectations. If management wants training efforts to be effective and organizational personnel policies to be accepted, they need to facilitate strong network ties among employees and be able to identify centers of influence within the network. As human resource practitioners are expected to make evidence-based decisions (Rynes, Giluk, & Brown, 2007), social network analysis can provide the data to show how organizational policies and practices around acquiring and preparing human capital affect the organization.

Performance management systems are an important part of any organization. They are tied to compensation policies, training and development programs, and promotion and downsizing decisions. They can also help determine how well company strategy is being implemented (Liao, Toya, Lepak, & Hong, 2009). Despite the clear importance of having an effective assessment system in place, research has shown that employees and organizations alike are both relatively unhappy with the current methods. More than 60% of employees feel that current review processes do not help them improve performance, and more than 70% of organizations that use appraisal systems
are only somewhat satisfied, not very satisfied, or extremely dissatisfied (Fox, 2009; Ruiz, 2006).

To understand why these processes are not entirely successful, we must first look at what types of performance measurement approaches are being used. One of the common methods used in organizations is the attribute approach: Managers of the company identify traits and competencies they believe are important for the company’s success and rate employees’ performances based on supervisors’ perceptions of the employees possessing the given attributes (Heslin, Latham, & VandeWalle, 2005). The behavioral approach evaluates performance based on employee execution of specific behaviors, and as with the attribute approach, many of the behaviors important to success involve working well with others, communicating knowledge and expertise, being an effective team member, or some other social aspect. Both of these approaches typically rely on managers or supervisors using their judgment to rate employees’ traits and behaviors. In knowledge- or team-driven organizations that rely on employee interaction and the flow of information, the supervisor’s perception might not be the best indicator of performance.

For organizations that care about the socially driven traits and behaviors discussed above, social network analysis could be the answer to improving their performance measurement assessments. If companies are interested in how well an employee interacts with his or her teammates, the teammates will provide a more accurate rating than a supervisor will. This is also true for communication and interpersonal skills. The employees who are communicating with and interacting with the focal actor are best positioned to provide an accurate assessment of these skills and behaviors. Moreover, while possessing knowledge has merit in and of itself, companies are also interested in how this knowledge is shared and put to use. By asking employees questions about who they go to for advice and expertise or who helps them generate new and novel ideas, it is possible to create knowledge network maps and quantify an employee’s knowledge output, thus giving organizations a new and meaningful way to measure performance.

Besides using social network analysis to evaluate individual outputs, this technique can also be used to diagnose team and structural inefficiencies in the organization. Teams rely on communication for many reasons, such as sharing individual roles and expectations, establishing a team mission, coordinating work efforts, and providing feedback. Therefore, breakdowns in communication are detrimental to team success. Organizations can use social network analysis to study their teams’ communication networks and find lapses or bottlenecks in the communication process. Are certain members isolated from the main group and not receiving the necessary information? Does one person have too much control in the process? Are there too many lines of communication, creating inefficiencies and redundancies in the communication process? These are all questions that can be answered by organizations that use social network analysis to understand their network relationships. Once the problem is identified, the organization can then start taking the appropriate actions to correct it, whether that means creating more formalized communication channels, encouraging team socialization, or removing individuals that do not seem to fit well into the network.

The development of corporate culture is a social process that can affect both broad values related to ethical issues at work (Umphress & Bingham, 2011) and specific beliefs regarding narrow topics such as adherence to safety policies (Zohar & Luria, 2005). Culture can also help employees identify with their organizations or help organizations stand out from their competitors (Gully, Phillips, Castellano, Han, & Kim, 2013). If a socially inappropriate culture starts taking shape in the organization, the company that understands its social network will be better able to identify the source of the negative influence and take appropriate action. Alternatively, companies that wish to promote a positive culture will know what channels will best help spread the message, and will know which areas of the organization tend to be isolated and may need special attention.

In addition to fine-tuning structure, social network analysis can also be an effective way to assess culture. Consider an innovative company that prides itself on collaboration and communication among its employees. A traditional measure may ask, “How often do you communicate with your coworkers?” Everyone answers on the high end, and so it appears that effective communication is taking place. A social network approach would ask, “How often do you communicate with Employee A?” Now we find out that Employee A and Employee B communicate frequently, but never communicate with Employees C and D. Or perhaps Employee A believes that he or she communicates frequently with B, but B does not believe he or she communicates with A. These types of responses can indicate
lapses in the network and identify possible breakdowns in communication. A company using traditional methods might not recognize these kinds of issues, but companies that adopt a social network approach will.

Similar to culture, the implementation of strategy requires employee buy-in and is subject to the influence of the organizational social network. Any leader, from a CEO implementing companywide changes to a line manager making adjustments to the work schedule, needs the changes to be accepted by his or her subordinates. Once again, the leader who understands who holds sway and influence in the organization will have an easier time framing the new policies or changes in such a way as to be seen as beneficial to the influential employees, making buy-in more likely.

As noted earlier, peers are already used as a source of performance management information for many organizations. Peers who are working side by side or who interact with each other regularly can provide information and insight about performance that a supervisor or manager with limited exposure might not have (Woehr, Sheehan, & Bennett, 2005). Additionally, employees may possess more specific expert knowledge about job requirements than a manager responsible for overseeing many different jobs, and so peers can help provide a more accurate performance evaluation than a supervisor alone. Of course, one of the disadvantages of using peer feedback is the potential for friendship bias (Dierdorff & Surface, 2007). However, if peer evaluations are used as part of a more complete social network analysis system it is possible to control for friendship biases and to understand how personal relationships affect performance evaluations, possibly leading to more accurate performance measures. That is, one can assess “advice networks” and “friendship networks” at the same time, and then control for the effect of one on the other.

An important aspect of employee development is the formation of trusting interpersonal relationships (Elfenbein & Zenger, 2014). By interacting with more experienced members of the organization, employees can develop their skills and gain a better understanding of company standards and expectations. One way companies try to promote the formation of these types of relationships is through mentoring programs (Kram, 1985). While formal mentoring programs ensure that all employees are matched up with a mentor, these types of artificially created relationships may not provide all the benefits of a relationship that forms naturally (Chao, Walz, & Gardner, 1992).

Therefore, companies need to be aware of their informal mentoring relationships, another area where social network analysis could be used. By understanding who is interacting with whom and who is missing out on interpersonal development opportunities, organizations can focus their efforts and encourage socialization and relationship development where it is most needed. Researchers have hypothesized that one of the causes of “glass ceilings” and other barriers to advancement for women and minorities is the difficulty experienced by these individuals in forming meaningful mentoring relationships and breaking into the “old boys network” (Noe, 1988; Ohlott, Ruderman, & McCauley, 1994). Organizations that are well informed about the networks and relationships among their employees will be better equipped to combat barriers such as glass ceilings, and be able to ensure that all employees are given the same developmental opportunities.

The Compensation and Retention of Human Capital

One of the major drivers of compensation decisions is equity theory, or the idea that individuals evaluate the fairness of their compensation by comparing their situation to the situation of others (Adams, 1965). Specifically, the ratio of perceived outcomes to perceived inputs of the focal actor needs to be proportional with that of some critical reference person. Breakdowns in perceived compensation fairness can lead to disruptive employee behaviors such as loafing, work withdrawal, or theft, as these are ways employees feel they can bring balance to the equity ratio (Yang, Bauer, Johnson, Groer, & Salomon, 2014).

Given the comparative social nature of compensation, this is another area of human capital in which social network analysis could be used to make more informed decisions and to better understand how employees receive these decisions. First, it could be useful for companies to identify who their employees are comparing themselves to. Even if an individual is the best-paid employee for a certain job at one organization, if that individual compares himself or herself to employees at other organizations who make more, the feeling of inequity could still exist.

Organizations that understand internal and external networks will have a better gauge of what
their employees expect and will be better positioned
to make and explain compensation decisions. Ad-
ditionally, research has shown that employees’
perceptions of pay fairness are based on their per-
ceptions of inputs and outcomes, not the actual in-
puts and outcomes (Bamberger & Belogolovsky,
2010). By using social network analysis, organiza-
tions can gain a better perspective of how em-
ployees view their pay relativity and the work
production of their coworkers. Knowing where
perceptions of inequity exist allows managers to
more effectively discuss pay decisions with their
employees, and could help them identify other un-
derlying problems that are leading to these percep-
tions of inequality.

As mentioned in the previous section, social
network analysis can also be used as a way to
measure performance, and effective performance
management systems should be tied to compensation
outcomes (Trevor & Wazeter, 2006). If the company
cares about knowledge management and innovation,
it makes sense to reward employees who are central
in those processes. If the company cares about in-
tegrating new employees, it makes sense to reward
employees who are helpful in that process. If the
company cares about effective teamwork and pro-
social behaviors, it makes sense to reward the em-
ployees who are getting along with everyone and
have a positive influence on the company culture.
Many behaviors and outcomes companies want and
expect from their employees are socially driven. By
using social network analysis, organizations can
recognize who is demonstrating these behaviors
and delivering these desired outcomes and reward
them appropriately, reinforcing their value to the
organization.

Beyond these applications, social networks can
also support employee health and wellness. Given
the recent attention to rising health care costs,
many companies are exploring ways to preempt-
tively improve employee health by establishing
employee wellness plans. Social network re-
searchers interested in adolescent behaviors and
decision making have found that personal health
choices can be heavily influenced by peer groups
and social network influences (Ennett & Bauman,
Also, culture and organizational norms can be spread
through these same social networks. Companies that
are able to identify individuals with influence and
centrality in their social networks can attempt to use
these individuals to help promote healthier habits,
such as engaging in regular physical activity or
quitting smoking. Additionally, these influential
individuals could be used to establish and recruit
members for company-sponsored sports teams, which
provide a source of exercise for employees and could
also promote teamwork and cohesion back in the
workplace.

Limitations of Social Network Analysis in the
Human Capital Domain

Although social network analysis has a wide vari-
ety of uses in this domain, one also has to note several
potential limitations. In an organization that values
and rewards (explicitly or implicitly) network con-
nectedness (or other network positions and skills),
one may see employees (including managers) engag-
ing in increased social interactions. While that may be
a positive outcome, it may also result in interactions
that are more frequent but of lesser quality. Too much
employee socializing (social loafing or social butter-
fly) can result in loss of time and focus on sub-
stantive matters. Employees may try to connect with
the individuals with high centrality and overwhelm
these individuals with interruptions and friendly
exchanges.

Further, the collection of sensitive data on who
interacts with whom (how often, how long, where,
where, and why) can produce information that can
be subject to abusive or unethical use by the com-
pany, company managers, and those who have ac-
cess to it. Firms may inappropriately try to benefit
from such information, and in some cases this in-
formation may result in firing of or discrimination
against certain employees (e.g., isolated employees,
or those who have redundant ties).

CONCLUSION

Social network analysis is a methodology that
is gaining momentum across a wide variety of
sciences. It allows researchers to take a relational-
based perspective of phenomena not easily un-
derstood by more traditional individual-attribute
approaches. In a field such as human resource
management, in which so many human capital de-
cisions are influenced by social relationships, social
network analysis can provide organizations with in-
sight and information previously unavailable. It can
be used to:
- Identify and select more productive employees.
- Improve training and development programs and
facilitate knowledge-management programs.
• Identify key employees and guide compensation and pay decisions.

As technology continues to improve, organizations will be able to develop efficient social network analysis systems, and companies that understand the social and knowledge networks driving their human capital will have a clear advantage over their competitors.

Social network analysis also provides management and human capital researchers with a valuable yet underutilized tool for developing more thorough theory and knowledge. We hope that by formally introducing social network analysis to the human capital community, we have provided researchers and practitioners alike with a novel method for approaching their work. This should ultimately lead to a more well-rounded and comprehensive appreciation of human attributes and human capital, as well as relational attributes and social capital.

REFERENCES


Kilduff, M., & Brass, D. J. (2010). Organizational social network research: Core ideas and key debates. *Academy of Management Annals, 4*(1), 317–357.


---

**John R. Hollenbeck** (jrh@bus.msu.edu) is a University Distinguished Professor at Michigan State University, as well as its Eli Broad Professor of Management at the Eli Broad Graduate School of Business Administration. He received his PhD in management from New York University. He conducts research on team performance and multi-team systems.

**Bradley B. Jamieson** (jamieson@broad.msu.edu) is a PhD candidate in the management department at Michigan State University. He received an international MBA from the University of South Carolina. His research interests include leadership within teams and social networks, and strategic human resource management.