

Social Networks

Christine has had a long day at class when she comes home to find her roommate, Jenn, with a new haircut. After the requisite—and true!—compliments, she asks where Jenn got the fabulous cut. Jenn says she decided to try this different place downtown, about thirty minutes away in a remote location. “Why in the world would you go there?” Christine demands. Jenn explains that she heard about it from her friend, Megan. Christine does not know Megan—no surprise, Jenn has a million friends—but something sounds familiar about this place. Just two weeks ago her friend Mark had gone to the same out-of-the-way place because he read about it on Yelp!. “Wait a second,” Christine ponders. “Something is going on here.” Christine and Jenn puzzle out the connections. “Aha!” they both exclaim simultaneously. It turns out Mark knows Megan and Megan knows Jenn. Satisfied, Christine goes to make dinner, thinking, “Maybe I should get my hair cut...”

This one lucky hair salon has been the beneficiary of the strength of weak ties. Suddenly an entirely new group is going there, just because of one key person, Mark, who ventured to gather information outside of his group of friends. By understanding the dynamics of networks, we can see how word-of-mouth communication can travel in surprising ways. There is a lot of information in this one flimsy connection.

In this chapter, we will cover the basic concepts of network theory and discuss its importance for understanding social media. The chapter will begin by providing definitions of networks and their properties and then apply this research to understand phenomena in social media, the diffusion of innovations, and word-of-mouth communication.

NETWORK ANALYSIS

Understanding networks is all about understanding our social world as a spiderweb of connections. Sometimes the spiderweb can be dense; other times, it is loose. Sometimes it falls apart altogether. Network analysis looks at social connections as if they were a map. This basic perspective is based on **graph theory**, an area of research from mathematics that studies the properties of nodes, their connections, and their relationships. Graph theory, and the theories of networks have arisen from it, has been applied to just about everything—from



understanding how the brain works, to studying interstate traffic patterns, to mapping how we find out about a new coffee shop or get a job (Barabási, 2014).

The graphs produced by the study of networks are based around nodes, which can represent a person, organization, object, or idea (Monge & Contractor, 2003). In social science, these nodes usually represent a person. Sociologists have taken this basic perspective and applied social network analysis to a wide range of problems, from studying how businesses thrive to understanding how kids make friends at school (Wasserman, Faust, & Faust, 1994). From the perspective of **networked individualism**, individuals are a node in many different networks (Rainie & Wellman, 2012). Through these networks, we operate as individuals, but draw from latent connections in the network when we need help or want to share information.

As we can see in Figure 9.1, each person in the opening vignette is represented as a node. When they have a relationship, this is represented by a line, which we will call a link, tie, or **edge**. An edge represents some connection of interest. Here, it represents the transmission of information from one person to the next. Dan C. from Yelp! tells Mark about the hair salon, Mark tells Megan, and Megan tells Jenn. Christine and Jenn are able to put all of this together because Mark had mentioned the salon to Christine, as did Jenn. In graph theory, edges are sometimes represented as having **directionality**, an arrow to represent the flow of the relationships. In this example, we marked the edge between Dan C. and Mark with an arrow to indicate that information went *from* Dan C. to Mark. In this way, ties can represent the flow of information through directionality. Communication can flow one way, as when you access a product review website to learn about the newest digital cameras. Or information could flow from you to the website if you post a review of your latest digital camera purchase. Or it can be reciprocal, as you exchange information equally with the website, reading and posting content. Whether a platform offers reciprocal or nonreciprocal links can be an important factor in structuring the flow of information and influence. For instance, social network sites are often structured through the creation of reciprocal ties (i.e., if you are friends on Facebook, the link is reciprocal), whereas Twitter is based on one-direction links (i.e., if you “follow” Kim Kardashian, this does not mean that she will follow you) (boyd, Golder, & Lotan, 2010). In a system with nonreciprocal links, a social structure where a small set of users have enormous followings without themselves following many others is possible and even

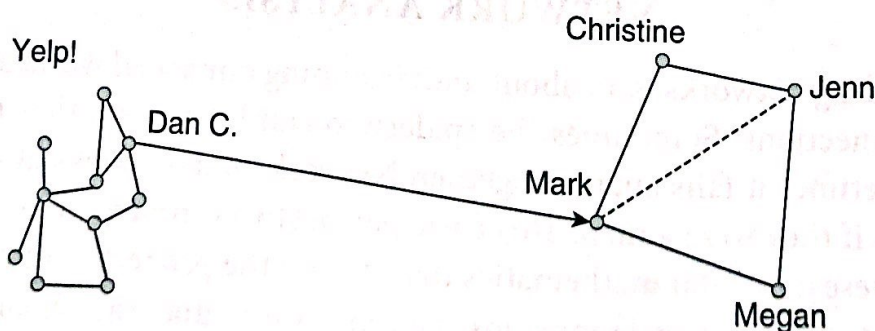


Figure 9.1 Networks in Word-of-Mouth Communication.





Photo 9.1 Facebook Connections Worldwide, 2010.

likely. Unlike a system with reciprocal links such as Facebook, status hierarchy can be much more clearly symbolized in a system with nonreciprocal links (to see what the network looks like globally, see Photo 9.1).

Network analysis can tell us about social distance—how close together or far apart we are via connections with other people. A **degree** describes how far removed one person or node is from another person or node. For instance, Christine has a second-degree relationship with Megan (they are connected by Jenn), but a first-degree relationship with Mark. Degrees are often displayed on social networking sites like LinkedIn and can even determine access to other users and privacy settings (Papacharissi, 2009). On Facebook, 92% of users are connected by four degrees or less (Backstrom, 2011). It turns out we are surprisingly close to people who may feel very far away.

It's a Small World, After All!

Say you are looking for a job in California and you live in Wisconsin. How many connections will you need to get in touch with someone who lives in Los Angeles and works in the movie industry? The psychologist Stanley Milgram asked just such a question in an early experiment about social networks. From his office in Cambridge, Massachusetts, Milgram mailed letters to 160 people he picked randomly from the phone book in Omaha, Nebraska. In this letter, Milgram instructed the recipient to forward the letter to someone they knew who might know the “target” of the experiment, a person Milgram knew personally in Cambridge, Massachusetts. The recipients were instructed to only forward the letter to someone they knew personally on a first-name basis. Letters went out, and within two weeks Milgram received a response that took only two degrees. Responses continued to pour in, and after averaging out the number of degrees needed for the letters to reach their targets, Milgram came up with the now famous, magic number: 5.5. The average number of links required for a letter to



reach its target was, more casually, 6 degrees. Many people are probably familiar with this idea through the game *Six Degrees of Kevin Bacon*, which involves linking Kevin Bacon to other celebrities through a network of co-stars. It's come to be called the "small-world phenomenon" and has been replicated in everything from movies, to job connections, to Internet links. The small-world phenomenon has many different implications, but to understand some of these, we first must know a little more about networks.

Properties of Ties

Think of all the ways you might know someone. Your acquaintance could be a friend, a co-worker, or a family member of somebody you met at a party. Network analysis is based on boiling these many different types of relationships down to a few critical properties. Relationships can be represented as either binary (either you know someone or you don't) or a continuum. **Tie strength** usually represents the closeness between nodes. If two people communicate often and communicate through more than one medium, they are said to have strong, or close ties (Granovetter, 1973). Further, it turns out that people are more likely to form social ties with those who are like them on some dimension (gender, race, educational background), which is called homophily. The tendency to form homophilous ties means that we have close ties with people who think and act a lot like we do. This is why when you sign online you may see five people who have chosen to share the same point of view on the latest news scandal. Homophily means that we often end up "preaching to the choir" on social media.

Strong ties are important. Close relationships provide us help and support as we face hardships, raise kids, and do homework (Putnam, 1995). However, in one of the most cited studies about networks, sociologist Mark Granovetter shows that *weak ties* can also be important (Granovetter, 1973). Say you are looking for a new place to eat. All of your friends likely have the same information you do. They know the best Mexican, Italian, and sushi places where you live. There is nothing new there. However, consulting someone outside your close circle of friends might yield some new and helpful information. There may be a great place that your friends have simply never tried. This is the basic insight behind the opening vignette. Through the weak tie of a review on Yelp!, this lucky salon has garnered a new set of clients. For savvy users of word-of-mouth communication, this is crucial.

In some cases, ties can also have a positive or negative value. In a study of Epinions, Slashdot, and Wikipedia, where users could form positive or negative ties by reviewing or voting for each other, 80% of ties were positive. However, certain patterns emerged based on **balance theory**, the idea that we seek a balance in our attitudes and opinions about others (Leskovec, Huttenlocher, & Kleinberg, 2010; see also Wimmer & Lewis, 2010). Think of it this way: if you are friends with someone and they like someone else, it is likely that you like that person as well (it can get pretty awkward if you don't!). You are also likely to have common enemies (Figure 9.2). By this logic, certain patterns of ties occur more

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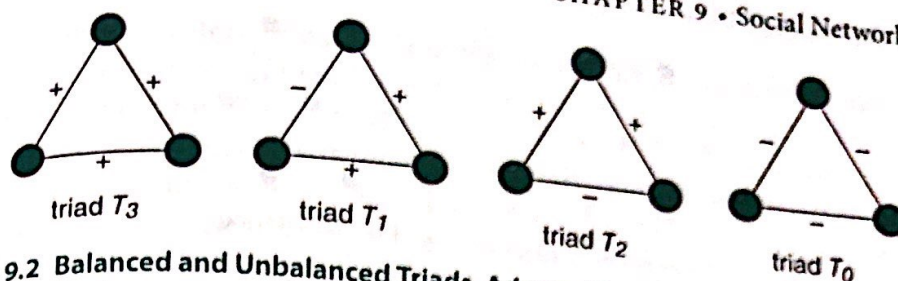


Figure 9.2 Balanced and Unbalanced Triads. Adapted from Leskovec, Huttenlocher, & Kleinberg, 2010.

than others in social networks. For instance, it is extremely rare in these types of networks for your friend to like someone and for you to dislike them (Leskovec et al., 2010; Wasserman et al., 1994).¹

Network analysis helps us understand one-to-one or **dyadic** relationships as well as **triadic** relationships, but stepping back and looking at the network as a whole can also grant us a lot of insight (Wasserman et al., 1994). In the next section, we will consider properties of the network itself.

Properties of Networks

Remember high school? If so—or if you’ve seen a few John Hughes’ movies—you might remember that there were separate friend groups, or cliques. They ate lunch together, they walked down the hall together, and they may have had classes together. In fact, a study shows classes are the primary way high school relationships are formed (Muller & Mueller, 2013). These groups of close friends can be described as highly clustered. For instance, the network of Facebook friendships in Figure 9.3 shows clusters from different periods in life: one cluster of colleagues, one cluster of family members, one cluster of college friends, and one dense cluster from high school that itself has clusters within it. **Clustering** is when nodes

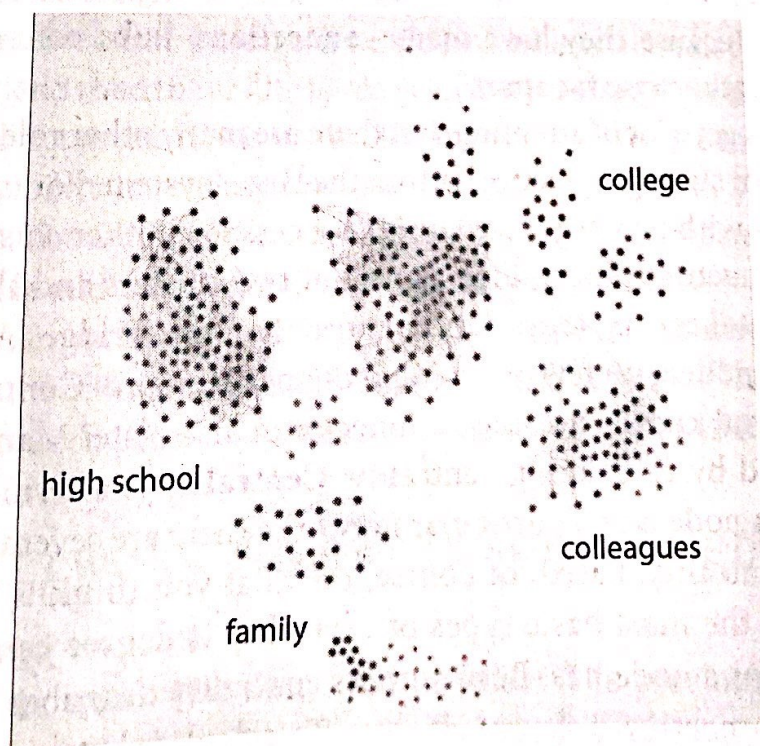
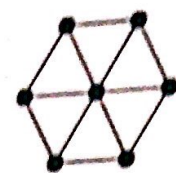
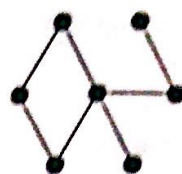


Figure 9.3 Clusters in the Author's Facebook Network.





High Clustering



Low Clustering

Figure 9.4 High versus Low Clustering.

tend to be closely related by one-degree connections (Watts, 1999). A measure called the clustering coefficient describes the number of links that a given set of nodes has. So, for example, if seven nodes have twelve different connections, that would be a lot of clustering; everyone knows everyone else. However, if seven nodes have only seven connections, that would represent less clustering; there may be some people in the network who only know one other person in the group (Figure 9.4). When two different clusters have different sets of information, but no way to share it, this is called a **structural hole**. In many cases, someone in a position to bridge this structural hole has a lot of value to the network (Burt, 2001). Understanding where clusters exist means that some people, or “nodes,” can have more influence depending on where they are located in the network.

Properties of Nodes

Some people simply have more acquaintances, and we call these people **connectors** or **hubs**. Connectors are important because they bring together people who would otherwise be unrelated. Think back to our opening example of the hair salon. Because Jenn knows a lot of people, she is the crucial link between these different friend groups. Typically hubs have many diverse connections, and they are critically important to how information flows through a network (Weber & Monge, 2011). Because they have many connections, hubs connect clusters of people who are otherwise far apart.

Connectors get a lot of attention, but there are many other roles in a network, each with its own strategic position within the larger system. For instance, a **gatekeeper** is a node with privileged and unique access to another cluster. A **bridge** is someone who is actually embedded as part of two clusters and therefore unites them. Unlike gatekeepers, there can be more than one bridge. And finally, the **poor isolate** is a node with few or no connections (Monge & Contractor, 2003).

So how do you know if you are a connector or an isolate? Many of these roles can be measured by calculating centrality. **Centrality** is a term for describing how important a node is in a particular network. There are several different ways of describing centrality, based, of course, on what you think is important. For instance, one of the most basic types of centrality is **degree centrality**, or how many connections a node has. **Betweenness centrality** describes how important the node is in connecting different clusters. To calculate betweenness centrality, you would need to first calculate clustering in the network and then see who lies

between these clusters tends to be direct. Networks that when we compare people with a lot of work is decentralized. Therefore, laying information

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between these clusters. Finally, closeness centrality measures whether a node tends to be directly or indirectly connected to other nodes in the network.

Networks themselves can have different properties that can be important when we compare them. A network is **centralized** if there are only one or two people with a lot of connections and hence a lot of power in the network. A network is **decentralized** if most of the people are connected to most of the other people. Therefore, no one person has a lot of power, at least when it comes to relaying information.

Emergence: How Networks Form

Studying networks requires a slightly different way of thinking than we may be used to. In psychology, the basic idea tends to be that if we can understand how one person responds, we can build that into an understanding of how a group of people will respond. This idea is called **methodological individualism** or **reductionism**. From this perspective, the whole is simply the sum of its parts. However, with networks, or any complex system that has lots of moving parts, something funny happens called **emergence**. **Emergence** is “any order, structure, or pattern appearing in complex random events that cannot be attributed to some specific pre-pensive purposeful activity or decision by some identifiable official or unofficial component or entity” (McKelvey 1997, p. 359, quoted in Monge & Contractor, 2003, p. 11). Imagine a beehive. In a beehive, bees have different roles—some bring food, others build the hive, others make more bees—and this system of roles and their relations make the hive what it is. Without one of these components, the hive would break down; it would cease to be a hive. In this sense, the whole is greater than the sum of its parts.

Closely related to this idea is the concept of **network effects**. Network effects describe the gains in a system when more and more people use the network. For example, consider text messaging. If just one other person in the world had the capability to receive a text message, it would be a useless technology. If your parents but not your friends had the ability to receive a text message, it would be a little more useful, but still not great. However, by 2011 more than 73% of people in the United States had the ability to send and receive a text (Pew Research, 2011; see also Pew Research 2015). The fact that the network of users is so large means that texting is a lot more valuable and useful. Economists study network effects in many systems—from interstate networks to phone, Internet, and movie distribution networks—and we will discuss the economic side of these effects in Chapter 14. The system of stable relationships between people or nodes has some serious value (Benkler, 2006).

NETWORK THEORY IN SOCIAL MEDIA

Social Capital

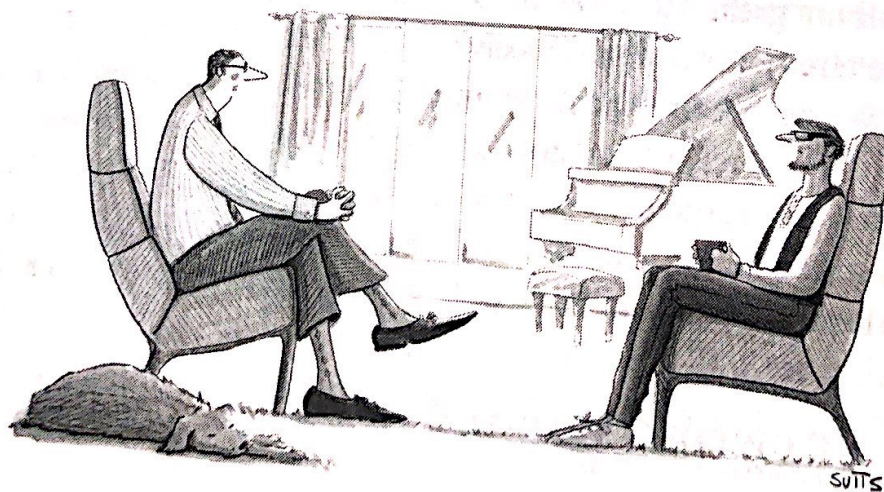
Connections have value. But what kind of value? The previous section covered the value that comes from a network of information and conduits for that information (Burt, 2001), but there is a more robust way to think about the value of



networks. These nodes in our networks give us what sociologists call social capital. The measurement of **social capital** is relatively straightforward—it is simply the number and strength of social connectivity. But the consequences of social capital can go far beyond mere connections (Appel et al., 2014).

The sociologist Pierre Bourdieu first coined the term social capital to mean “the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition.” This social network “provides each of its members with the backing of the collectivity-owned capital, a ‘credential’ which entitles them to credit, in the various senses of the word” (1985, p. 248). Social relationships are like a stock; they can store value until you need to activate it—to get a job (Lin, 1988), to meet potential dates, or to pick up your sister from school. The network of social relationships that surrounds us has value and can sometimes even be converted to financial capital (Cartoon 9.1), as when a business deal goes through because of mutual friendships. But social capital is a resource in many other ways. Our friends can comfort us when we lose our job or befriend us on a Saturday night. Surveys show that Internet users have more social connections, more social capital than non-Internet users (Ellison, Steinfield, & Lampe, 2007; Horrigan, Boase, Rainie, & Wellman, 2006; Rainie & Wellman, 2012).²

This new world of networked individualism is situated around looser, more fragmented networks that provide social capital (Rainie & Wellman, 2012). The hallmark of networked individualism is that people function more as connected individuals and less as embedded group members. Many fulfill their social, emotional, and economic needs by tapping flexibility into sparsely knit networks of diverse associates rather than relying on tight connections with a relatively small number of close friends (Rainie & Wellman, 2012; Wellman et al., 2003). For example, Rainie and Wellman (2012) describe a woman who was hospitalized after a fall and, through the efforts of her husband, received overwhelming support—both emotion and financial—from a diverse set of acquaintances and their acquaintances, both local and far away, some people whom the couple had never met.



"Jessica tells me you have a Twitter following in the six figures."

Cartoon 9.1 "Jessica tells me you have a Twitter following in the six figures." Twitter Followers as a Form of Social Capital.



Many Kickstarter campaigns operate on the same principle, where people seek to fund their projects through friends and friends of friends.

Social capital is a resource, but its activation can have distinct consequences in social life (Coleman, 1988). Social capital can entail obligations and expectations. For example, if you post on your friend's Facebook wall for her birthday, she will likely feel obligated to do the same on your birthday. Although we feel little, but some, reciprocal obligation with people we do not know (Cialdini, 1993), it is much stronger for those we know. Trust is another consequence of the norms and expectations that follow from social bonds. If you need to know whether a new dress looks good on you, texting a picture to your friend and soliciting her feedback might be more helpful than sending it out to the world for judgment. Your network of friends can, in itself, give people a reason to trust you because it provides evidence that others already trust you (Donath & Boyd, 2004).

Social capital can also serve as an information channel. For example, if you happen on a new coffee shop that is a good study spot, you may convey that information to your friends with a status update (just don't tell too many people). By virtue of their social relationship with you, your friends now have more information about where to study than they did previously (Katz & Lazarsfeld, 1970). This function of social capital will be important when we return to considering word-of-mouth communication.

Last, social capital can be instrumental in enforcing social norms, or informal rules of collective agreement. When we have ties with people, we are affected by their judgments and feel pressure to act in accordance with their expectations. In many cases, this can be a good thing, but consider what happens when norms of our social network are not in our own best interest.

Social capital can be an individual resource, but it can also be a group resource, providing the basis for trust in a society. Since the foundational work on social capital, sociologists have used the number and depth of social connections as a measure of social cohesion. For example, in his book *Bowling Alone*, Robert Putnam (1995) argues that social capital has eroded in the United States, which he attributes in part to the "individualizing" effects of technology and Internet use. Networks of close offline friends are typically rather small, between five and six people (Wang & Wellman, 2010), but numbers change throughout one's life stage as well as historically over time. According to one study, the closeness of these relationships has diminished, with people reporting an average of about three close friendships in 1985, but only two close relationships in 2004. More troubling, the most common response to a 2004 question about strong ties was that respondents had no one with whom they could discuss important matters (McPherson, Smith-Lovin, & Brashears, 2006). Yet as Rainie and Wellman (2012) argue, dormant networks of acquaintances can actually be quite large. Because of shifts in communication technology and social life, rather than living in tight, geographically bound networks, people now exist as networked individuals, able to call on a large and diverse set of connections when they really need them.

The claims about the decline of social capital in the United States have been hotly debated (Norris, 2002; Paxton, 1999). Scholars using measures of social



trust rather than membership in social organizations find that it is just as high in the United States as it has ever been (Norris, 2002). Further, social trust is correlated with newspaper readership and television ownership, tools that connect citizens with a broader imagined community (an idea to which we will return in Chapter 11). These debates about whether social capital is declining bring us to important refinements of different types of social capital and their effects on people's lives.

Types of Social Capital

There are at least two kinds of social capital: bridging and bonding. **Bridging social capital** is the value that friendship has to unite two different groups of people. The weak ties discussed earlier in the chapter have bridging capital. On the other hand, **bonding social capital** is the value a relationship might have to provide lasting and meaningful social support. Strong ties provide this kind of resource. Ellison et al. (2007) found that Facebook gives college students both bridging and bonding social capital, providing a sense of community and social trust among newfound peers at college as well as bridging ties with former high school networks. In a follow-up study, they found that using Facebook resulted in having more friends a year later and improvements in measures of psychological well-being, such as life satisfaction and self-esteem. Further, those who benefited the most were those who initially had low self-esteem (Steinfeld, Ellison, & Lampe, 2008).

As we have seen in this chapter, although there are many good things about social networks, there can also be bad things. Through the enforcement of norms, social networks can inhibit or enable actions that may not be in one's self-interest or that of others. For example, in cases of cyberbullying, the fact that dense social connections exist—everyone knows everyone—can mean that rumors spread quickly and can make harassment seem inescapable (Alvarez, 2013).

Online versus Offline Social Networks

Throughout this chapter we have examined the role social networks play in organizing online worlds. But how do they relate to offline worlds? Although scholars used to think people would use online communication to primarily make new connections online (Rheingold, 1993), it turns out that online communication is more often used to strengthen and maintain existing offline social ties (Ellison et al., 2007). It is becoming more apparent that online and offline social worlds are deeply embedded in one another. Online interactions supplement existing social ties, and yet people still communicate more frequently with people who are physically nearby (Wellman, Haase, Witte, & Hampton, 2001). Offline ties are readily apparent by observing online data, and researchers were able to predict tie strength in offline social networks using data available only through Facebook based on the number and type of messages exchanged as well as indicators of homophily such as level of education (Gilbert & Karahalios, 2009). So, although scholars initially considered online social worlds to be different from offline



social worlds, more recent research has started to view them as embedded. Sometimes we expand our offline social networks through online communication. For example, people may make new connections for the purpose of exploration, shared interests, emotional support regarding a stigmatized issue, or simply for fantasy and fun (Turkle, 1995/2011). However, we also strengthen and maintain offline social ties online. Some social networking sites like Match.com are developed specifically for meeting new friends, whereas others like Facebook are developed around strengthening existing social ties (Piskorski, 2014). Online communication, in fact, enables us to manage a large and diverse set of social ties, which can serve as a potential resource when we need social, emotional, or financial support (Rainie & Wellman, 2012).

SOCIAL NETWORKS IN PRACTICE

Diffusion of Innovations

Roles in the network play a critical role in the diffusion of a product or idea. For example, **market mavens** are actors who gather and disseminate marketplace information about prices, products, and consumption practices (Feick and Price, 1987). Some bloggers as well as YouTube reviewers who post “haul” videos showing off their new purchases are two examples of market mavens online. As journalists like Malcolm Gladwell have popularized, connectors, people who serve as hubs of human relationships, can be key conduits for the spread of trends (Gladwell, 2006; Granovetter, 1973). Because of their relationships with many different types of people, connectors make it possible for new information to flow through the network. However, although connectors clearly play an informational role, the *adoption* of a trend also depends on the participation of a critical number of people in your network (Granovetter, 1978).

Social networks play a critical part in the dissemination of information and influencing behavior. However, some scholars have countered this view of diffusion, arguing there are obvious and influential barriers to the viral spread of ideas such as laws, norms, and cultural understandings (Humphreys, 2010). For instance, in one of the foundational works of diffusion, Rogers (2010) shows how cultural ideas of hot and coldness impeded the adoption of boiling water in Peru. Although people were exposed to the idea of boiling water to prevent infection—an idea that could drastically decrease the risk of waterborne illness—this was not enough to ensure adoption. People could not just “catch” the idea like a cold. Rather, it needed to be made congruent with prior cultural norms and beliefs. So the process can be complex, and thus more about word-of-mouth communication will be covered in Chapter 12 on social media and culture.

Social Influence

Because people can occupy different places in the network, they have different amounts and types of **power**, or social influence (Castells, 2007). Market mavens, for example, collect a lot of marketplace information and thus have the ability to



influence purchase decisions (Feick & Price, 1987). YouTube endorsers of makeup, for example, can influence what products viewers purchase, and those who become popular, many of them still in high school, receive products from luxury makeup brands like MAC and Bobby Brown. Similarly, fashion bloggers can develop devoted followings and thus also social influence when it comes to designers and brands. In some cases, popular fashion bloggers even “cross over” to the offline fashion industry, having developed the cultural capital to influence trends and styles (McQuarrie, Miller, & Phillips, 2013). We will return to some of these roles in the next chapter on virtual communities when we consider how people gain status in communities online.

SUMMARY AND CONCLUSION

As this chapter has illustrated, the way people are connected has important implications for social communication and influence online. Social networking sites like Facebook or LinkedIn can offer us maps of social relationships, but to put these to use, it helps to understand properties of nodes, ties, and networks as a whole. As it turns out, it may be a smaller world than we think. In the next chapter, we will go further to consider how persistent and repeated interaction between a group of people over time can create more permanent and meaningful social groups—communities—that can develop their own distinct set of norms, values, rituals, and traditions. As we will see, there is no richer world of variegated and intense interests than the world of online communities.

TOPICS

- Network properties (centrality, tie strength, directionality)
- Roles in networks (connector, gate keeper, bridge, hub, isolate)
- Strong versus weak ties
- Bridging versus bonding

DISCUSSION QUESTIONS

1. What kinds of power exist in a network? Are there different kinds of social influence according to different roles? What role does network structure play in who has power?
2. Do you think that social media increases or decreases social capital at a societal level? If so, what types of social capital are created?

EXERCISE

Create a network for your friend group. Then describe which nodes are connectors, bridges, liaisons, and isolates. What are the clusters and how dense are they? How centralized or decentralized is your network?

