LEARNING IN NETWORKS

Most learning is not the result of instruction. It is rather the result of unhampered participation in a meaningful setting. Most people learn best by being “with it,” yet school makes them identify their personal, cognitive growth with elaborate planning and manipulation.

Ivan Illich, Deschooling Society

In this chapter we delve into a detailed discussion on the social form of networks, with a focus on the learning opportunities and challenges associated with this class of social interaction. Networks are a central social form in human societies. Sociology, anthropology, business, and other disciplines have studied their function and form for many decades, and there is ample literature on social networks in a wide variety of communities. However, networks have been used to a lesser extent in formal education, at least partly because their loose form often conflicts with and can be disruptive to institutional structures. They are not bound by processes, roles, or deliberate architectural sculpting. They can be formalized, but not formally constituted. And yet networks are among the primary knowledge conduits of the world; throughout our lives, we learn from people that we know. The spread of knowledge through a network closely resembles the spread of infection: learning is contagious (Kleinberg, 2007), for good or ill.

Recently, the development of low-cost and portable devices allowing for network development and engagement anywhere/anytime has accelerated interest in and the use of networks for distance learning. In the previous chapter, we saw that group norms and customs evolved largely in face-to-face contexts, in
which presence, trust, and shared environment created the background context. Today’s learning networks, however, operate and evolve primarily in a mediated context. There are new possibilities networked technologies enable that were difficult or impossible to reach prior to the advent of cyberspace. In this section we detail the underlying affordances of networks as a background to examining the learning activities and contexts that can be expected to thrive under these conditions.

**DEFINING THE NETWORK**

A network, in the loosest sense, consists of nodes (the points on the network), and edges (the connections between them). Networks are not only visible in human interactions: in nature, ecosystems, chemical systems, geological systems, galaxies and solar systems can be viewed as networks. Similarly, designed physical systems such as the Internet, transit systems, power grids, and roads can also be viewed as networks. In systems that involve humans, networks can be seen in everything from the social connections between individuals (Wellman, Boase, & Chen, 2002) to the relationships of actors and actants within a dynamic system (Latour, 2005), from the epidemiologic patterns of disease diffusion (Watts, 2003) to the interactions that occur within a city (Alexander, 1988; Hillier, 1996). Human systems share much in common with their inanimate counterparts and obey similar dynamic laws (Watts, 2003). Our focus, however, is not so much on the abstract or even physical structure of the network, but on the social structures it enables for learning.

**Networks are Concerned with Individuals**

It is possible to see networks in any learning engagement that involves other people, including within, across, or beyond the perimeters of a group. Networks are constituted in connections not as formal or informal processes: they are of a different ontological type than a group. Membership of a group is by definition membership of a network, but this does not negate the value of understanding group processes as distinct from the network: they are different kinds of things. Although concerned with human interaction, the social network-centric view of the world is, perhaps ironically, heavily focused on the individual. Indeed, Rainie and Wellman (2012) explicitly describe this form of engagement as “networked individualism.” It is possible for a researcher, informally or formally, to examine the topology of networks and explore their nodes and edges, and to perform
analyses of the forms they take as though they were distinct entities. However, lacking a designed structure or concept of membership, from the perspective of any individual member of a network it is constituted egocentrically, as people with whom one has a connection of some sort. We do not do things for the good of the network as we do for the good of the group because this makes no sense—it is not an object as such. It is simply the description of our many connections with others, and with the visible limits of these connections.

**Networks are Uneven**

Diagrams and maps of social networks typically show multiple threads connecting network nodes or members in complex arrays. The hierarchical structures of groups give way to structures that are fluid, complex, and that evolve to create new linkages as old and unused ones atrophy. The network structure forces and affords individuals and sub-networks to engage in responsible decision-making for themselves rather than relying on others to make decisions or filter information flow. In aggregate, the people in a network make decisions and move in specific directions, but the direction and focus of this movement cannot usually be dictated by any individual member. Rather, in the interactions of networks, members’ directions, strategies, and ideals are created and enacted. It is, however, an oversimplification to suggest that networks are topologically flat structures where all play an equal role. Small-world networks are an extremely common form in social systems, with parts of different networks joined by highly connected nodes and supernodes that are typically of greater relative importance than those with fewer connections, at least when we are looking at flows of information or feelings. However, this is a complex area of ongoing study: while highly connected nodes with many edges are important to the spread of knowledge through a network, they are not necessarily the most influential nodes in a human system, nor do they effectively close connections among other nodes. Rather, they are necessary conduits through which knowledge flows and may be filtered or transformed.

The unevenness of networks relates not just to their topology but to their temporal characteristics. Activity and clusters within networks occur in bursts and are often sporadic, with hard-to-predict ebbs and flows. This is unsurprising given that, unlike the group, there is no intentional coordination of behaviour in a network. Topics of interest emerge for a large number of reasons, and these spark conversation. Sometimes a particular blog post, article in the media, notable piece of news or TV segment may act as a catalyst for conversation. Sometimes, the internal dynamics of networks themselves spread ideas and dialogue. The spread of
memes, replicating ideas, phrases, or, most often in modern cyberspace, images of cats, is easily facilitated through networks.

**Networks are Uncertain**

Network learning is qualitatively different from group-based interaction because it introduces elements of both uncertainty and opportunity. The audience for a networked communication is the heterogeneous members of that network who may share some values, interests, and qualities in common but, beyond the reason for the connection in the first place, are unlikely to share more. Groups share homogeneous goals and norms, whereas the differences between people and their interests in networks provide opportunities for the emergence of new friendships, development of social capital, emergence of conflict, and other unanticipated instances.

It is this openness to the possible that both attracts and repels potential network learners. For some distance learners, the lack of face-to-face interaction means trust can only be built after considerable exposure to group interaction, and they gain both personal and professional understanding of one another, combined with the trust engendered by context and norms that arise from membership in an institution or class. For others, the group’s homogeneity creates sameness and boredom, with restrictive constraints entailed by the need to work at similar times and at a similar pace to others in the group; they seek out the network for its capacity to provide exposure to the learning opportunity of the unknown.

**Networks are Diverse**

We are typically connected to different people for different reasons. They may be friends, we may meet them at conferences, share groups with them, interests, locations, buy things from them, meet them at a party, know their aunt; the possibilities are endless. What defines a network is the sum of the people with whom we have a connection for whatever reason. The lack of homogeneity in networks means that problems that are shared with them are viewed from multiple perspectives, increasing the potential range of solutions and creative ideas to draw from (S. E. Page, 2008).

**Networks are Clustered**

The corollary of there being multiple reasons that we are connected with others is that it is possible to cluster people we know into different, typically overlapping sub-networks. Subnets are characterized by Google+ as “circles,” which is a useful
term that we commonly use to distinguish different parts of our network. We have different circles of friends, people who share professional interests, casual contacts, and so on. These subsets of networks make it easier to identify those who might help us in different learning contexts. If we have the technologically mediated means to distinguish them, we can focus questions or things we share on those who are most likely to have an interest or knowledge about them.

Networks Foster Cooperation

The network provides an ideal context for sharing information, ideas, and questions as opposed to collaborative working, where roles and rules are more appropriate. But sharing itself is not a unitary concept and has many culturally, contextually, and individually defined dimensions. Talja (2002) extracts from the literature on academic research communities four types of sharing activity:

1. Strategic sharing: information sharing as a conscious strategy of maximizing efficiency.
2. Paradigmatic sharing: information sharing as a means of establishing a novel and distinguishable approach or area.
3. Directive sharing: information sharing between teachers and students, or employees and employers or other networkers seeking to perform a specific task.

Networks in learning contexts are used for each of these four tasks, and the network gains in value when any of them bear fruit, as demonstrated by networkers’ satisfaction and use.

Networks are Borderless

As Milgram (1967) famously showed and others have since confirmed, we are all connected to one another via a very small chain of people. In “Six degrees: The Science of a Connected Age,” Watts (2003) reports on experiments that confirm the chain between one person and another is six or less, whoever they may be, wherever they may be in the world. In essence, viewed from above, the world can be seen as one huge network of people.

Networks are not Technologically Constituted

Networks are constituted in terms of connections with others and, while technologies can support and enhance them, there are no consistent or defining rules,
processes, or methods in a network, whether implicit or codified. Networks are not, in and of themselves, technologies. Of course, individuals may overlay all sorts of processes on a case-by-case basis, and this is often the way networks coalesce into groups: some form of codification is created that distinguishes them from a loose assemblage, including the establishment of names, purposes, ground rules, schedules, and so on. Networks themselves are diffuse, bottom-up, and have undefined perimeters. Though often technologically enabled and benefiting from technologies that reveal them, no technology other than language (at least in most cases) is required for them to form.

The lack of technology or intentional architecture means that, if they are to be used in intentional learning, more effort is needed on the part of the learner. The roles, processes, and methods embodied in groups are designed to make things easier, and they are not available to the networked learner. While the group-based learner may be actively engaged in the social construction of knowledge, he or she is seldom involved in the construction of the process to achieve that. To learn deliberately is to assemble the means and methods of doing so. In groups, they are assembled for you. In networks, you must assemble them yourself. Networked learning, as Connectivism suggests, is as much about acquiring meta-skills in learning as it is about the learning itself. In the absence of a teacher role, this typically means that the networked learner must discover sources of inspiration from within the network through role models, or discover the learning design in some other way. Typically, the process of doing so will mean discovery of instructional resources in the loosest sense of the word, leaving the networked learner in a hybrid position: employing behaviourist/cognitivist tools yet at the same time engaging in authentic social practice.

**Many Learners Are Loosely Tied**

Internet scholars have written about the distinction between “dense bounded groups” and “sparse unbounded networks” (Wellman et al., 2002). This work flowed from the study of informal organizations in wired communities, but similar forces are at work in the socializing modes found in networked-based groups. Wellman et al. (2002) found that group and network relationships are common in both work and community contexts. They note that groups are most often associated with locally bound communities where relationships evolve through proximity, even in the absence of choice. We are forced to interact with those we live, work, and attend class with, regardless of any affection or interest. Distributed
networks, of course, eliminate this constraint and allow us to form both networks and groups with people who may be very widely physically distributed. Beyond physical proximity, networks are supportive of the creation of weak ties (Granovetter, 1973) that serve as bridging connections to other groups and networks. Networks often have higher percentages of weak ties than strong ones, but each type has advantages and disadvantages. Strong ties are associated with closeness, multiplexity (multiple forms of interaction), and higher levels of intimacy, immediacy, and frequency of interaction. These are generally positive attributes, but strong links can also lead to “amplified reciprocity,” where individual freedom is constrained due to obligations of mutual support, inertia, and lack of interest in building relationships outside of the group (Gargiulo & Benassi, 2000). Networks and other models of human organization associated with weak ties offer greater diversity, provide wider and less redundant sources of information and opinion, and increase individual and community forms of bridging capital (Ellison, Steinfield, & Lampe, 2007).

Gargiulo and Benassi found that the development of social capital is not directly related to the creation of stable and secure strong ties; rather, “managers with cohesive communication networks were less likely to adapt these networks to the change in coordination requirements prompted by their new assignments, which in turn jeopardized their role as facilitators” (2000, p. 183). In rapidly changing contexts, the creation of social capital remains important, but change requires flexibility and the diversity often associated with weak ties rather than stable, strong relationships. Moreover, Burt argues that these weak ties foster “structural holes” or disconnections that allow the nimble to exploit opportunities “to broker the flow of information between people and control the form of projects that bring together people from opposite sides of the hole” (1997, p. 340). Those with more extensive network relationships are thus “at higher risk of detecting and developing good ideas, because of which they enjoy higher compensation than peers, more positive evaluations and faster promotions” (Burt, 2009, p. 46), giving them more opportunities to create knowledge, social capital, and wealth.

Networks, with their bridging of structural holes, can in principle reduce the propensity for negative and inhibiting group behaviours and culture. However, the lack of structure also means that commitment may be lower, or at least of an ad hoc and unpredictable nature. Too much diversity can also be counterproductive, leading to chaos or randomness (S. E. Page, 2011). Without some redundancy, the dynamic and changing nature of networks can leave gaps when
those filling a particular niche leave the network or move to the outer limits of its boundary.

**COOPERATIVE FREEDOMS IN NETWORKS**

The degree of freedom afforded in a network-based learning context is typically very high (see figure 5.1). This is both a blessing and a curse because choice is not equivalent to control (Dron, 2007a). Too many options, especially in a learning context where we may have little idea about appropriate tools, methods, content, or individuals from which to learn, can make it very difficult to choose between one path or another, and may leave the learner in a worse position for control than if he or she had no choice at all. The archetypal theory of networked learning, Connectivism, shows this in sharp relief. In many ways, connectivist methods are concerned with the meta-level of learning: learning how to learn in a white-water world of constant change and uncertainty.

![Figure 5.1 Notional cooperative freedoms in a network.](image)
Time
Compared to group-based ways of learning, freedom of time in networked learning is typically high, though there are often dependencies relating to the availability and activities of others in the network. If a learning path is instigated by a particular blog post, or involves interaction with others, the availability of other people determines when and how participants might learn. This is very dependent on context though: some kinds of learning conversation in a network can spread out over years while others, such as those about a recent news topic, can be over in hours or days. One of the most distinctive features of network-based learning, as the Connectivist model suggests, is that it is typically self-instigated rather than imposed by a designer, so not only can it begin with an inspiration from an interaction with others, it can also emerge from the individual. Learning often starts with a process of creation, be it a blog post, video, discussion post, question in a forum, or simply a comment on another post.

Place
As with all cyberspace learning, freedom of place is very high in network-based learning. There are a few exceptions where location may be important, for instance where a network develops through augmentation of a physical space by geotagging or virtual cairns left by others in a network (Platt & Willard, 1998), but these are relatively rare.

Content
Freedom to choose content is, by definition, high in a networked learning model. Net-based learning is often concerned with discovering and tracing paths to content through a network, for instance, following links posted in Twitter, LinkedIn, or Academia.edu, and freely choosing what and from whom we learn. There are some subtle constraints, however. An individual’s view of the network is always limited and localized. Filter bubbles, where machines or individuals filter out all but confirming sources of data, can emerge where preferential attachment leads to certain resources, and particularly the content created by a limited range of popular network nodes that is far more likely to be selected. While the network may extend fuzzily outward to encompass almost anything available in cyberspace, the emergent organization of a network can strongly emphasize some while leaving others outside of it, only slightly connected and with little chance of being found. This is not necessarily a bad thing—most certainly, the range and diversity of content in networked learning will always be far greater than in a
group-oriented learning context, and exponentially greater than in an instructivist setting. However, there is a concern that “popular” is not necessarily equal to “useful”: what appeals to a diverse collection of people who have some shared learning goals but not others may emphasize the bland, the attractive, the powerfully stated, the easily digestible, and so on. This is particularly risky because connectivist models place a great deal of emphasis on members of a network being contributors and creators rather than consumers. Content is often curated, mashed-up, re-presented, and constructed or assembled by those in the network. This is a wonderful resource when seen as a co-constructed and emergent pattern of knowledge-building, but without the editorial control that a teacher or guide in a group provides, it can lead to network-think, a filter bubble in which social capital rather than pedagogy becomes the guiding principle. So, while freedom is high, there are still patterns shaping the selection of content, and unlike those in a more constrained group setting, these may not align well with learning needs. Furthermore, the wealth of content that is proactively flung at us in social networking systems may lead to an excess of choice, and hence diminished control (Schwartz, 2004).

Delegation

While grouped forms of learning include the reassuring role of a teacher to whom one can delegate control, with the concomitant risk that the teacher may take more control than one might wish, the strong emphasis on an individual’s learning path in networked learning, especially given the read/write mode expected of networked learners, makes it much harder to delegate control to another. Networks have a social shape, not a cognitive shape, and the emergent guidance that is inherent in the form may not lead us to useful places. Because the path of connectivist learning is not carefully planned, it is not possible to fall back on a predetermined route, and the networked learner must therefore rely on the goodwill and availability of others if he or she needs to let go of the learning reins for a particularly complex or challenging sequence of learning activities. The problem is exacerbated by the fact that learners, by definition, do not know the subject they are trying to learn sufficiently well and therefore may not know how to ask the right questions, even if someone in their network may know the answers. Of course, should learners find the right person to help in their network, it may well be possible to delegate decisions about the learning trajectory to them; at this point, teaching becomes one-to-one, rather than a function of the network, with all the benefits that entails.
Relationship
Freedom of relationship in a networked context is maximized. Within a network we choose how, when, and whether to engage with others, without any constraints beyond that those we engage with must be, by definition, part of the network. Again, networks are about local interaction, not in the geographic sense, but in the sense that they are only ever perceived in relation to an individual node and its neighbours: networks can connect us with others only where connections between adjoining nodes are available to us. While a group may be viewed as a whole, a distinct entity apart from the people within it, a net is constituted only in the local connections between people.

Medium
The choice of medium in networked learning is typically very high. The networked learner is typically able to select from a vast variety of media to suit his or her needs and may deliberately cultivate networks that make one or another medium more significant. For example, networks of people on YouTube will make video a dominant form, while those in a social network for book lovers such as goodreads.com or even Amazon will tend to favour text or images.

Technology
The only constraints on the choice of technology in network-based learning are that the tools and processes we use must facilitate connection. They should directly or indirectly be connected with the network. We also acknowledge, however, that many of these tools are expensive, and thus there is an inherent constraint—especially on those with little or no disposable income.

Method
While there are no particular constraints on methods that may be used as a consequence of being in a networked-based learning context, the nature of the social form precludes the kind of controlled, paced, formalized pedagogies that may be the norm in a group-based learning context. Networks are very good for surfing ideas, following paths wherever they may lead, going on tangents, and connecting disparate ideas and skills, but to follow intentionally focused paths they are more limited. Having said that, there is nothing to prevent a learner from using the network to discover focused groups or behaviourist/cognitivist resources in order to take a structured path to learning, but the network form itself is by definition emergent and lacking in distinctive pedagogy. Connectivism, the most fully
formed of networked learning theories, is more of a meta-pedagogy, specifying an approach to exploration and exploitation rather than designing a learning path.

Pace
Net-based learning typically offers a great deal of control of pace at a macro level, but the interdependence of learning with others can, like group-based ways of learning, lead to dependencies on the availability and interest of others. When a learning conversation opens up around, say, a blog post or a Twitter stream, it is important to engage in a timely fashion in order to be part of the learning dialogue. This dependence on the availability of others, is however, notably offset by the persistent nature of much networked communication. For instance, someone may respond to a blog post months or even years after it was posted, reviving interest and activity in it after a long period of dormancy. The pace of interactions and the expectation that it is a timely stream makes this less likely to occur in Twitter or similar micro-blog technologies.

Disclosure
Most computer-based systems with social networking facilities provide a significant amount of control over what is revealed and to whom, Facebook’s constant battle to remove such control notwithstanding. Assuming the technology allows it, the networked learner is free to reveal as much or little as he or she wants. Having said that, there are limited benefits to a social network if everything is kept hidden. The inherent lack of structure and norms in a network means that, with the ease of digital replication that most social networking systems provide, information provided to a small range of individuals may spread through their networks to others.

Transactional Distance and Control in Networks
Moore’s theory of transactional distance (1993) assumed a formal learning context in which a single teacher or teaching presence was engaged in a learning transaction with a single learner. We have seen that, in group-based learning, the teacher role may be taken by other learners, which can lead to a reduction of transactional distance when measured as a communication or psychological gulf, but an increase in distance when measured in terms of control. In a networked learning context, the teacher role is distributed among an indefinitely large number of teaching presences, from blogs to peers, from key network
nodes to comments on discussion posts. An individual may be both teacher and learner simultaneously. Negotiation of control in networks is a constantly shifting, emergent phenomenon in which the learner is engaged in multiple relationships, each with their own dynamics of control and psychological distances but, in aggregate, transactional distance is low on control in both of these dimensions. From a learner perspective, control can increase and communication/psychological distance can diminish. However, that comes with a strong proviso: an increase in the number of choices may, without the means to choose between options, reduce the control of the learner. Having many choices is not the same as having control (Dron, 2007a; Schwartz, 2004).

Examining this more closely, if there are just two people in a network, then transactional distance may be lower or higher depending upon the strength of the network tie, bearing in mind that, as we have already observed, a dyad may be seen equally as a group, net, or set. If, say, we post a tweet and it is responded to by a follower of someone we follow, then the communication distance is low but the psychological distance may be quite high: we do not necessarily know them or their motivations, and understand little of the context in which they are writing. If the friend that links us then responds, this not only perforce reduces the overall aggregate psychological distance but also the psychological distance between us and the original poster, because their post has gained greater validation by the response of our friend, helping us to understand more of the context and value of their original contribution.

NETWORK TOOLSETS

In this section we describe some of the functionalities of the current generation of network technologies, relating them to the needs of learners who are making use of their networks for learning. Many of these functions are contained in suites of network tools such as those found in Facebook, Ning, Elgg, and others. However, whether through aggregation standards such as rss and Atom, service-based architectures, widget-based systems, or even by embedding framesets, learners are also often able to “mashup” their own network tools to create personal learning environments. These mashups may be more or less integrated.

Many people maintain more than one network channel on their cellphones, tablets, and computers, with instant messaging applications, social network tools, and feed aggregators providing a constant flow of traffic from them. These are often bound together and linked through tools that integrate them in tablet apps,
websites, and other devices: for example, a large number of iOS or Android apps allow content to be shared with other apps, such as Twitter, Facebook, or Google+ that may themselves be network-oriented applications. Given their diversity, it is thus challenging to describe in an exact sense the functions of network tools since they are constantly morphing in look, feel, and function, so our categorization is broad and flexible. In general terms, and in keeping with the individualist focus of networking, most network tools provide one or more means of representing the self, through profiles, presence tools, avatars, and so forth. Networks would be of no value without the means to communicate with others in them. As a result, network tools also provide a means of creating content and sharing it with others. These tools also normally offer facilities for building and sustaining networks of connections. We expand on these main features and some of their corollaries in the subsections that follow.

Profile Tools
The central component of most social networking systems is the profile, a means of displaying information about an individual used by others to find and add them to their networks. Profiles usually contain images (avatars) and a variable amount of other information about the person, which can range from just a name and perhaps location to a complete curriculum vitae, as well as shared content, records of interactions with others, contact details, and other information such as collectively generated reputation indicators and badges (we will explore these in depth later). Profiles serve as proxies for identity to help learners identify those with relevant interests or skills in their network, and assist them to discover more about people before connecting them to their own networks.

Content Creation and Sharing Tools
Networked learners, through participation in networks that reify their interactions, are almost always “prosumers”—people who both consume and produce network content (Bruns, 2008). Blogs, wall posts, instant messages, tweets, file sharing, video sharing, photo sharing, podcasts and many other tools for sharing content are an essential part of a modern social networking system, providing the medium and focus for further interaction to occur. The creation of content is one of the central requirements of connectivist learning pedagogies, and the means to create shared content is thus pivotal in providing tools for knowledge construction and tools for sharing and expanding on that knowledge.
Communication Tools

For network-oriented tools, there is a very blurred line between content sharing and creation tools and those whose main purpose is communication. The facility for commenting is ubiquitous, found on everything from photos and videos to shared blogs, curated items, and bookmarks, so in a sense, almost all modern social media facilitate communication. However, some network-oriented functions are concerned with direct dialogue: email, instant messaging, videoconferencing, IP telephony, SMS, direct messaging tools in social networking systems, discussion forums, and so on provide the means to contact one or more people in a network, typically managed through a list of contacts or address book. The means to carry out a sustained dialogue with one or more people in a network facilitates many social pedagogies in both the social constructivist and connectivist traditions of learning. The main difference between such tools and the embedded dialogue that surrounds blogs, for example, is the flexibility of purpose. While comments on blog posts can and frequently do diverge from the topic of the original post, the post acts as a basin of attraction, an object of dialogue that seats the conversation, and usually persists over time, while communication-oriented tools are concerned with the ephemeral process of conversation.

Presence and Status Tools

Networks allow learners to make their presence known or else conceal it, both asynchronously (typically through profile settings) and synchronously (e.g., status indicators in an instant messenger). Presence notification can support presence in physical space, as provided by the tools for mobile social networking, or for helping to identify those in social proximity who share a common interest in an educational- or discipline-related interest. Presence indicators are also being added to text, audio, and video communication and conferencing tools to allow us to see which of our friends or colleagues are available for instant answers, feedback, and interaction. Of course, this sense of presence must be under the control of the individual learner; there are times when we welcome the presence of “kindred souls,” while there are other times when we need the freedom to protect and maintain our privacy and anonymity.

Often related to presence tools are status indicators that reveal current activities, interests, or moods. These may be as simple as “at a meeting” indicators or emoticons, or may be brief text messages. Author Dron, for example, travels a great deal and so typically indicates his location in his status message. Some tools integrate with others so that, for example, a status message indicates which piece
of music a person is listening to. This rich information greatly increases a sense of social presence and connectedness that reinforces weak ties and sustains an awareness of another person’s activities, making it simpler to catch up and more effectively lubricate the social wheels so that interaction is easier when people in a network more sporadically engage in richer conversation. Often, such status updates form a topic of conversation for a broad network, allowing further connections to be built and individual networks to be extended.

Notification Tools
The sporadic and bursty (occurring in bursts) nature of network interactions means that it is vital for all members to be proactively informed when people on the network are trying to connect. Contributing to a learning network and not receiving feedback or acknowledgement of that contribution quickly discourages further participation. Good networking software provides both push and pull forms of notification. Using push tools such as RSS, instant messaging, or even email provides notification to the learner when new content or communication is entered into a learning space. Quality networking tools also allow historical and persistent display and searching of these interventions, so that the learning space can be searchable and span across significant lengths of time.

Referral Tools
Some of the most successful commercial social networking software, such as LinkedIn, MeetUp, and Facebook, is based upon providing selective referrals to other persons for social or commercial motivations and effective encounters. Most of these referral systems assume that those people you regard as friends are more likely to become useful and interesting friends to one another than a random selection of individuals. Thus, mining both weak and strong connections allows us to become acquainted with, and possibly work or learn together with others, with a greater probability of developing profitable exchanges. A variety of network tools make the discovery of others easier, most notably the ubiquitous “friend of a friend” functionality that recommends people you may know. This is an example of a collective application used for networking. However, referral is often more direct and manual: many social networking systems provide the means to suggest people that others may know, and some allow one to suggest groups or sets that may be of interest. Referral may relate to other people, or communities of interest. One of the great strengths of networks lies in the ability to exploit weak and indirect network ties, a matter of great importance when the knowledge a learner
seeks cannot be found within his or her circle of friends and acquaintances. As, seemingly, everyone is potentially connected to everyone else by a very small chain of network nodes and edges (Watts, 2003), it appears that someone not too distant from you in network terms may turn out to be the world’s leading expert on what you wish to know.

**Information Routing**

One of the key roles of a teacher in a conventional classroom is to draw attention to information and resources that are of value to learners. The Internet is awash with information, some extremely relevant to us, but most of which is irrelevant and merely creates unwanted noise in our networked environment. By routing relevant information to colleagues in our various networks, we serve as filters for one another and become critical tools of networked information management.

**Emotional Support**

Networks were earlier conceived of as instrumental tools to afford the undertaking of tasks and support communities of practice. But as network tools have evolved and engaged larger and more diverse sets of users, their function as tools for the emotional support of others has grown. For example, most social networks can be set to alert you of the birthday of anyone in your list of friends. Unlike earlier tools to support this type of notification, Facebook provides a variety of tools the user can employ to express their wishes on a networked friend’s “special day.” They can, of course, compose a traditional email; send an electronic card; post to their Wall, making a semi-public contribution to the recipient’s personal web space that is visible to them and their “friends”; “poke” the person to indicate that they are being thought of; post the information to a group or network to which the recipient belongs; engage in an audio, video, or text chat, or even compose an audio or video greeting. Thus, networks allow members to acknowledge and support one another in a variety of ways—most of which are totally free of charge and very easily composed.

**Value of Networks in Formal Education**

As our brief overview of some of the main tools reveals, networks can be valuable to learners, especially in a lifelong learning context, but also within a more structured and guided context.
An oft-cited observation has it that citizens must be lifelong learners in order to maintain their currency, employment, and relevancy in the context of a rapidly changing knowledge-based society. Rather than immersion in full-time study for a few pre-professional years of postsecondary education, policy advisors and educators now argue that learners need to develop skills, attitudes, and connections that will afford their participation in many forms of learning throughout their lives. Most educational groups, especially those that are institutionally organized and led by professional teachers, end very abruptly at graduation. Networks, however, persist and can be used as the basis of lifelong professional education and learning, as long as the participants remain in the relationship. Further, networks made up of participants from the professional world and pre-professional students serve to connect the often theoretical study of the classroom with the everyday problems and challenges of real life. Networks provide opportunities for mentoring, recommendations, and posting queries and requests for help that are heard beyond the protected environs of group-based learning. The capacity to add value and gain recognition within a network also serves students when they complete their studies. They are not only established with membership in a set of existing networks, but more importantly they have experienced and practised the skills needed to effectively use networks throughout their professional careers.

Global Collaborations

Networks support connected learning on both local and global scales. Recent concerns over global warming illustrate the growing awareness of the connectedness of all who inhabit our globe. Many global problems will not be resolved in the absence of international dialogue and coordinated efforts. Networks afford opportunities for learners to associate, negotiate, plan, and execute projects on a global scale with others. For example, the Centre for Innovation in Engineering and Science Education (www.ciese.org/collabprojs.html) coordinates a range of projects that allow learners around the globe to share data collection and analysis in areas such as water and air quality, real-time weather, genetic variations in human body size, and other challenging and intrinsically interesting studies of life science. A similar and hugely successful project, Earthducation, has connected networks of schoolchildren across the globe to a team of researchers, and actively engages them in what Doering (2006) describes as “adventure learning,” following him and his colleagues via the Internet on ecologically inspired expeditions around the world.
Workplace Networks

Although more commonly associated with informal and non-formal learning, networks offer flexibility, exposure, and the means to build social capital that warrant more serious consideration for their adoption in formal education. There are important lessons to be drawn from modern uses of networks in the workplace. These applications retain the purposive and task-oriented functionality needed for organizations to succeed, while representing a shift in thinking away from traditionally constituted hierarchical departments and centres. The most widely known research related to networks in workplace contexts is the work of Etienne Wenger on what he refers to as communities of practice (COP). COPs usually consist of co-workers located in a common workplace that develop and share their skills as needed, thereby creating solutions to common problems. In the process of completing these tasks, they develop mutually defining identities, shared jargon, and “shared discourse reflecting a certain perspective on the world” (Wenger, 1998, p. 125). Learning networks, however, are not defined as much by a shared location or description of work, but rather by an individual's need for task performance, learning, advice, or interpersonal support. The type of support or aid required causes the learning network to constantly morph its structure, rate of interaction among members, and communication tone in response to these tasks.

A range of tools and environments support explicit group-oriented learning within a networked context, allowing groups to branch off from networks for specific learning purposes. For example, CoolSchool, presented primarily as a Facebook application, brings learners and teachers together through Facebook, providing a system for running real-time classes and requesting or offering a lesson, along with a scheduling subsystem.

There are numerous learning activities that can be imported from familiar group contexts as well as from instructivist methods based on cognitivist/behaviourist models of teaching. In many cases, discussions, debates, critiques, and presentations benefit when the audience is expanded beyond a specific group. We see this commonly in the networks that spread out from MOOCs, with Facebook groups, Twitter hashtags, and other foci providing the means for networks to develop beyond the formal group and connect with others. These less homogenous contributions add authenticity and divergence of opinion that is often the basis for enhanced motivation and learning. Even when the primary source of learning is the closed group, networks can be used effectively to expand learning beyond it. This expansion easily includes students enrolled in the program who have already completed a course of studies, and these alumni add experience and
diversity to networked deliberation. Expansion to professional groups is perhaps most valuable in professional faculties, but even general studies can benefit from the experience of professionals who are in practice, have retired, or have even chosen to resign from professional life. As noted earlier, the Web’s global connectivity and data collection capacity can be used to design new learning activities. Data collected, shared, and analyzed in global contexts creates an expanded context that is inherently more valuable, fascinating, and motivating than similar activities in only local ones.

Informal networked learning presents both a challenge and an opportunity for formal education institutions. As more open and freely available educational resources become available, the monopoly of formal institutions over learning content is weakened. Similarly, as learners are able to connect with one another without mediation by employees of a formal educational institution, they gain the capacity to collaborate, share, stimulate, and support individual cooperative and collaborative forms of informal learning. The interest by governments, professional bodies, and employers in measuring and tracking competencies as opposed to credentials fundamentally threatens this last remaining monopoly of formal educational institutions (see, for example, Richards, Hatala, & Donkers, 2006). Networked informal learning acts as profoundly disruptive technology to formal education institutions. Christensen described disruptive technologies as those that are “typically cheaper, simpler, smaller, and, frequently, more convenient to use” (1997, p. xv). Since most informal networked learning is completely free to the learner, it is obviously cheaper than institutionally provided learning opportunities. Informal learning is chunked, sequenced, and scheduled by the learners themselves, thus creating appropriate-sized opportunities to engage in learning. The fact that networks are centred on the learner, not on processes and methods of groups in institutions, means that they bypass the careful controls of the institution. Facebook, for example, is commonly used by networks of students to support their formal learning activities in study groups that, on occasion, turn into mechanisms for cheating; at least, this is how universities perceive it (and in some cases they are correct).

Course Hero, for example, a website that boasts it has solutions to over half a million textbook problems, has over 265,000 fans of its Facebook group (Young, 2010). The ability of networks to easily allow learners to share and collaborate is forcing institutions and teachers to radically rethink traditional attitudes toward assessment and accreditation. Given their pivotal role in educational systems, this
in turn may mean a drastic restructuring of the purpose and methods of traditional education altogether, an issue we return to in our final chapter of this book.

We have already observed that networks can be scary places for teachers who are used to being in control. Effective network teaching involves some letting go, but also recognition of where a teacher can add value, whether as a subject expert, a reassuring guide, or a shaper of the study process. It is thus concerned with a balance between top-down and bottom-up control. In a group, rich communication and an identifiable hierarchy enables a teacher to engage in dialogue to enable learning even though it is likely that structure is, at best, tenuous. It is thus comfortably within Moore’s notions of transactional distance. In a network, the fact that the teacher is just one of a myriad of signals in the environment means the potential dialogue that helps to guide the less autonomous student is diluted or lost in a cacophony of voices that struggle to be heard. It is all too easy for a student used to the comfortable certainties and cosseting of traditional group-oriented institutional instruction to feel out of his or her depth and forced to make too many decisions about what and who to pay attention to.

Some of these issues may be addressed through a more structured design of the networked environment. Many social networking systems, such as Elgg, make it possible to impose a structure and appearance on a site that supports a given network, allowing the owner of a community to control the experience of the learner to a greater extent than more freeform social networks. However, that controlled space is just one of many that the student may inhabit in his or her personal or networked learning space.

Given the varieties of networks that learners participate in, of crucial importance are tools to manage, filter, and control information so as to make learning in networks efficacious. Specific recommendations include:

- Using high-quality and, where possible, open tool sets for finding, joining, forming, and supporting new and existing networks and their archives;
- Developing and deploying tools to support individual control of network filters;
- Supporting network deployment in contexts that are as open as possible;
- Using tools to support identifying, evaluating, and annotating resources by individual and collaborative network members;
- Creating linked profiles and other sophisticated search tools so that network members can come to know one another and contributions to the network are recognizable and valued;
- Using means of identity management such as OpenID to enable persistence.
of identity between systems;
• Allowing members to morph, parcellate, and combine networks as needs evolve;
• Using tools or processes, such as the soft security of wikis, which promote trust both of network artifacts and the people within them.

Connectivist models of learning are deliberately free from fixed learning outcomes. Because every learner’s constructed network is different, and trajectories are based on currency and emergent needs, networked learning does not take easily to the formalization of learning outcomes that underpins traditional courses. This does not mean that such outcomes cannot be stated in advance; instead, they are decided at an individual level and are constantly subject to re-examination and modification as a learner progresses, especially over a longer trajectory. In an academic world that is defined by learning outcomes, comparable courses, and assessment based on such outcomes, this presents difficulties for those attempting to enable networked learning in a formal context. A two-pronged approach of learning contracts and portfolios can help to overcome such obstacles.

Learning Contracts
One simple and effective solution to the problem of variable outcomes is to employ a learning contract, in which the learner specifies in advance what outcomes are intended and plans a learning path in order to achieve measurable outcomes. If it is to have value, it is important that this contract is negotiated with an expert, direct or embodied in a toolset, who can ensure that at least the minimum competencies are covered. If a learner wished to, say, become a medical practitioner, then it would be important to ensure that the learning undertaken is sufficient to support such a role and thus limit risks to potential patients. The use of competence frameworks can be helpful here, especially when they are designed by a variety of experts in a field.

Portfolios
While learning contracts provide a suitable mechanism for accrediting networked learning in some cases, they have limitations. In the first place, much networked learning is likely to fall outside the parameters defined for the contract, and will thus go unaccredited. This is true of almost all learning, from the most formal instructivist model to the loosest problem-based methods, and it just means that there are inefficiencies in assessment: not all that is learned is assessed. A more troublesome difficulty is that a contract-based approach does not easily allow for
direct comparison of individuals, nor does it easily fit with professional accreditation requirements. Competence frameworks and expert guidance can assist to some extent but, especially where learners are already competent in some aspects of a field, portfolios can play an important role in assembling evidence of competence for accreditation.

GROUPS EMERGE AS NETWORKS GROW

The fundamental role of facilitation, ownership, and other issues associated with leadership differentiate groups from networks. Educators, like other actors in hierarchical organizations, are used to creating learning environments in which students, as consumers, play their assigned role. Thus, many educators first approach network development as a task in which the learning activities are precisely outlined and students are commonly assessed by the teacher on their network participation. Many researchers, however, note the requirement for emergence in network learning models. See, for example, the special issue of IRRODL on emergence (www.irrodl.org/index.php/irrodl/issue/view/49). This implies that the members of the network have both the tools and authority to recreate the network’s form and function in response to changes in the environment.

Author Dron (2007b) emphasizes the need to design for this change, through use of evolutionary change theories (survival of the fittest activities, modes of sharing and creation of knowledge), and the percolation of networks into new instances, or tighter groups. Dron also notes the need for network designers to delegate much of the control over the network to users; however, they must also allow the network enough central control and capacity for applying appropriate constraint to curtail abuse by spammers or other malevolent users.

The desirability of facilitation, promotion, and activism involved in leadership is a very contentious issue among network theorists. Community of practice theorists have argued (Wenger, 1998) that one cannot intentionally or artificially create a community of practice—rather they are by definition self-organizing. But at the same time, Wenger and others talk about individuals who play key “community development” functions that provide leadership to emerging networks. They go on to discuss strategies by which community developers exit from leadership roles in the community of practice when it reaches unspecified levels of size, participation, and sufficiency in governance. An individual’s power in a network comes from influence, not design.
Our notion of learning networks has much in common with the work networks discussed by Nardi, Whittaker, and Schwarz (2002), referred to as intensional networks. They point out that, increasingly, networks and not groups are the defining features of much workplace activity, which we suggest relates to the work and study associated with formal learning as well. They argue that “intensional networks are the personal social networks workers draw from and collaborate with to get work done” (2002, p. 207). These networks are activated based on opportunities or requirements for production. This may be directly associated with a formal learning activity, but more often arise when an individual turns to their personal network in order to accomplish some learning activity alone. Like Nardi et al.’s intensional networks, learning networks consist of those directly enrolled with the learner in a formal course. They also consist of colleagues, family members, friends, former workmates, neighbours, and others who can be called upon to support the learning activity. Though learning networks may be stable and used by learners for a series of learning activities or courses, they can also be temporary and called into existence for one-off learning demands. Nardi et al. note that “intensional networks are not bundles of static properties. They dynamically pulsate as activity ebbs and flows, as different versions of the network come to life” (2002, p. 238).

Similar to Nardi et al.’s notion of intensional networks is the concept of ad hoc transient learning networks (Berlanga et al., 2008; Sloep et al., 2007), which are focused on lifelong learning that is intensely learner directed. Koper, Rusman, and Sloep (2005) define a learning network as “an ensemble of actors, institutions and learning resources which are mutually connected through and supported by information and communication technologies in such a way that the network self-organizes and thus gives rise to effective lifelong learning” (p. 18). An ad hoc transient learning network provides tools enabling learners to access, engage, and evaluate learning activities, often but not necessarily as individuals in ad hoc networks. They thus encourage developers to move beyond the class and course familiar in formal education to learning designs that allow and support learners to create their own learning activities, goals, and outcomes.

Unlike those of Nardi et al. (2002), Koper et al. (2005) are clear about the technological requirements for such coordination, and their team at the Open University of the Netherlands (OUNL) has developed a range of online tools that facilitate their formation. Somewhere between a traditional group and an informal network, ad hoc transient learning networks are loosely joined networks of people with shared interests who are brought together through the use of toolsets to assist their formation. The team at OUNL address design and implementation challenges
to build systems that help networked learners find appropriate learning content and paths to knowledge acquisition, connect with learners embarked on similar or related learning activities, assess their own competencies, develop personalized learning goals, and assess and authenticate self-directed learning outcomes. The computer-based technologies that underpin ad hoc learning networks play some of the roles occupied by traditional teachers and the surrounding apparatus of formal learning: enrolling learners, managing contacts, enabling the co-creation and curation of content, and assisting in the management of the learning path, though unlike a traditional group-based approach, the focus (network-like) remains on the individual learner and his or her goals, rather than a shared group purpose. The use of such tools places the systems used by Koper, Sloep, and others in the holistic generation of distance learning, moving beyond the loose networks of connectivist learning to something more guided and structured, yet still benefiting from the emergent strengths of individuals in a crowd.

**The Value of Diversity**

> *Learning and knowledge rests in diversity of opinions.*
> *George Siemens, “Connectivism: A Learning Theory for the Digital Age”*

For a learner in a network, there is typically greater value to be found in diverse networks than in those that are self-similar. If a network consists of many different people with various skills and interests, then there is a far greater chance that someone in the network will have the skills and interests needed to assist with a particular learning goal. Diversity encourages growth by making the likelihood far greater of different world views conflicting and being challenged. Such challenges require learners to examine their knowledge structures, reflect on their positions, and articulate their beliefs and opinions, thereby connecting and constructing a deeper and more meaningful knowledge system.

There are many different ways of measuring diversity in a system. S. E. Page (2011) identifies three main categories of diversity: variation, diversity across types, and diversity of community composition. Variation can occur between similar people of the same type: for instance, researchers in e-learning may have different notions of how best to evaluate a learning transaction. Diversity across types is concerned with a system containing multiple types of entities such as species, topics, or product lines, measurable in terms of entropy, network distance, or attributes. What defines a type is contextually situated: for example, gender may
differentiate types for some kinds of network, such as those who breastfeed, but may be completely irrelevant in others, such as those who research e-learning. Diversity of community composition, measurable by population, is concerned with the ways that different combinations of the same things can lead to different entities, such as the many and varied combinations of carbon, hydrogen, oxygen, and nitrogen used to make proteins. Which form of diversity is of most value will depend to some extent on the context and learning task. As a rule, type diversity will offer the most opportunities to ensure that someone within the network will have relevant skills. For example, if we are learning about global warming, then it will be valuable to have philosophers, climate scientists, economists, and poets within the network. However, especially where the network is one that centres around an area of expertise, it may sometimes be more valuable to find variation: for example, a learner who is making use of a network of learning technology experts in order to learn more about such things may gain more from a range of relevant skills in that area than from the presence of particle physicists or poets. Conversely, the potential for border crossing, creative connections, and transformative learning may be better enabled by a more diverse crowd, including physicists and poets.

Too much diversity can be overwhelming: the benefits of diversity are applicable only if the range of options to choose from is manageable. One of the most notable benefits of many networks (especially those that are scale-free or sparsely connected) is that they are, from the perspective of any node, limited in scope. As well as acting as a natural brake on diversity, this feature also enables variation, speciation, and diversity to occur within a large network. If everyone can see what everyone else is doing, with maximal connectivity, then an evolutionary pattern sets in where only the fittest survive, however fitness may be measured. For example, imagine a nightmarishly distorted hypothetical network that works a little like Twitter, with the twist that everyone is following everyone else. In other words, every tweet from every one of its hundreds of millions of users would be sent to every other. Imagine then that, unlike the real Twitter, this network provides no means of filtering sets of posts by topic (hashtag), nor is there any concept of age or ageing of tweets, but this system retains the network-oriented feature of allowing retweets. The chances of a new tweet surviving an onslaught of existing retweets would be minimal. Almost all that anyone would ever see would be retweets, which would mean that almost the only posts retweeted would be ones that had already been retweeted. Unless further mechanisms to limit expansion were introduced or were extrinsic to the system (e.g. some news headlines might
have a large enough effect to impinge), in a rampant example of the Matthew Effect (Merton, 1968) these would soon be reduced to a few that would entirely dominate the rest.

If everything is in direct competition for attention with everything else, without further temporal or spatial variegation, there will be only one or, at best, a very small number of winners within any given niche. This is true whether we are talking about memes, ideas, patterns of behaviour, or cultural expressions. Luckily, such hyperconnectivity is unlikely to be found in the wild, though larger network applications that fail to take such issues into account can and do suffer from problems caused by excessive connectivity between network members, as anyone with more than a few hundred Facebook friends is probably already aware. Attention is a limiting resource for which many posts compete. S.E. Page (2011) notes that, in a system like this that involves replication, variation and competition for survival, there are four main ways that this chaos of undifferentiated connectivity is avoided: “geographic heterogeneity (allopatry), isolation of a small subpopulation (peripatry), divergent neighboring niches (perapatry) and diverse niches in a common environment (sympatry)” (p. 95). These factors remain significant in a virtual environment as much as in a physical space. Limitation of scope (allopatry and peripatry), whether artificially induced through group formation or emerging along geographical lines, is a diversifying benefit of small communities, which inherently parcel late a set of individuals and, in many cases, impose or imply a set of shared values which develop differently from others around them. Perapatry (divergent neighboring niches) is a prime mechanism that saves networks from overconnection thanks to the innate limits of connectivity between individuals and the effects of groups that concentrate connections, which means that most networks are far from uniform. This differentiation is aided and abetted by limits to the speed with which ideas, patterns, memes and knowledge spread between nodes of networks and the clusters within them. Network diversity can also benefit from diverse niches (sympatry), such as those introduced through set-oriented mechanisms like Twitter hashtags or through individuals splitting a network into sets of individuals (circles) that relate to their different interests.

CONTEXT IN NETWORKS

Closely allied to diversity is network context. While Facebook founder Mark Zuckerberg famously proclaimed privacy to be dead (O’Brien, 2010), it is nonetheless true that people present different identities in different contexts, and are
not participants in a single network but many (Dron, Anderson, & Siemens, 2011; Rainie & Wellman, 2012). This is particularly important in a learning context where the networks that relate to our academic or personal learning projects may be quite different from those that relate to, say, our hobbies or friends, and where there may be many sub-contexts that interest us, like different classes, courses, subject areas, and so on. If we are receiving a stream of information and updates via a social networking site, it is very convenient to split the stream into different areas of interest. In many cases, we may choose different social networking spaces for different networks that we belong to—Facebook for friends, LinkedIn for business contacts, academia.edu for academic contacts, and so on. Each will provide a slightly different, if often overlapping context. Alternatively, an increasing number of sites that utilize social networks provide tools for splitting networks into more manageable chunks: Facebook Lists, Google+ Circles, LinkedIn’s variegated ways of specifying relationships, Twitter’s Lists, Elgg’s collections, and so on. These mechanisms go some way toward allowing manageable diversity, albeit at the cost of having to take time and effort to manage our circles, lists, or collections.

OWNERSHIP OF NETWORK ARTIFACTS

Debate over ownership of digital content has proved to be very disruptive issue on the Net and provides fuel for the emergence of many different forms of digital products. Publishers and media producers have seen their profits attacked, and in some cases obliterated, by the tools and techniques developed by both consumers and producers of media who often distribute their products at no cost to the user. In education we see equivalent disruption and opportunity brought about by Open Educational Resources (OERs).

The school or corporate entity that sponsored its creation has most often retained ownership of specifically designed educational content. This institutional ownership model, however, has been challenged in university contexts, where professors often lay claim to ownership of course content as a traditional right of academic freedom. This contention often leads to questions of ownership and disputes that have proven very difficult to resolve. In the worst cases these disagreements lead to “patent thickets” in which the threat of ownership and enclosure by one or more of the creators of the content makes it impossible for anyone to legally benefit from it (von Hippel, 2005).
IDENTITY IN NETWORKS

When one moves beyond the familiar camaraderie of the group to the open network, effective management of one’s identity becomes critically important. Before discussing the particular tools provided to both reveal and conceal the personal, it is useful to review the rationale and means by which users present themselves to the outer world.

Individuals are constantly walking on a balance beam where they attempt to reveal enough of themselves to gain the benefits of social interaction, discourse, and commerce. At the same time, they try to protect themselves from the crowd, so that they have places and times when their actions and ideas are allowed to develop in privacy. The goal of all but the most reclusive hermits among us is not to maximize our privacy. Indeed, maximum privacy—as in solitary confinement—is used as a punishment in many criminal systems. Neither is the goal of complete openness, where no actions, ideas, or words are held privately in the self or shared with only a small number of confidents.

The Internet has irreparably disrupted this balance, leading to instances of “identity theft” and both perceived and real invasions of privacy. For example, A. Smith and Lias note that “typically victims in the US may spend on average $1,500 in out-of-pocket expenses and an average of 175 hours in order to resolve the many problems caused by such identity thieves” (2005, p. 17). Further, the popular press and individual parents are aghast at the amount of personal disclosure engaged in by both young and more mature Net users. Conversely, cyberspace has been instrumental in the development of countless new personal friendships, collaborations, and even marriages. We often ask for a show of hands when delivering keynote speeches, querying the audience for those who know someone who has married another that they met in cyberspace. Invariably, the question reveals that many of us find camaraderie, love, and lust using the affordances of cyberspace, and specifically various social software tools.

We come to know one another through the presentation of ourselves in Net spaces. In his seminal 1959 work, Erving Goffman defined a new field of sociology that he called dramaturgical sociology (1959). He masterfully tied together metaphors of the stage and its actors to describe how people manage their “presentations” or plays for the benefit of self and others. Goffman’s plays took place in real time and in face-to-face interaction. Nonetheless, the prompts, settings, front and back house etiquette, audience and actor interactions also are performed in cyberspace, and are often amplified.
Goffman describes two types of impressions we use during the course of our presentations of self. The first are those that are carefully crafted and presented or given to the audience. The second are those displays of self that are “given off” often inadvertently, through words, deeds, gestures, or expressions. These breakdowns or partings of the curtains arouse in the audience “an intense interest in these disruptions . . . that comes to play a significant role in the social life of the group” (Goffman, 1959, p. 14). In face-to-face interaction, given off displays include style of dress, accent, body language, choice of topic, and quality of discourse. They include the many ways we can stumble both physically and metaphorically, and how we respond to the unexpected. In cyberspace, these clues are somewhat constrained and often focus on written discourse. However, as Walther (1996) and others have pointed out, a host of compensatory tools and techniques are used, even in low-bandwidth Net contexts, to create forms of hyper-communication that compensate and in some ways create enriched contexts for developments of the self that exceed those available in face-to-face contexts. As cyberspace evolves to support immersive, videoconference, and other rich forms of interaction, we see continued means by which participants add novel channels of communication to present themselves.

Thus, cyberspace affords its actors a powerful set of tools which they can use to present themselves. But what exactly are they presenting? Higgins (1987) notes three quite distinct psychological entities that actors present to others. The first is the “actual self,” the set of attributes that the individual actor possesses and displays, perceived by others. The second is the “ideal self,” those attributes that the actor wishes to possess, and which defines his or her hopes and aspirations. Finally there is the “ought self,” those attributes belonging to both the actor and those of importance to them that define what they perceive others expect of them. We shall see that cyberspace provides ample opportunity for presentation of each of these senses of self—the challenge for both actors and audience is to differentiate the context, time, and space in which each is presented.

A final attribute of the stage upon which we present ourselves is the role of others—both actors and audience. Goffman goes into some detail developing his stage metaphor to include interactions between audience and actors and the backstage discourse among teams of actors. Networks also support these interactions. As we have seen in group interaction, the discourse and collaborative activities team members engage in is critical to learning and the production of learning artifacts.
In networked interaction, exchanges between both active and potential network members are much more complicated. The complications arise most obviously in response to the size and fluid nature of network actors. But of even greater importance is the diminished certainty as to the nature of the audience. Network members share similar interests in the topic, ideas, or activities that motivate their membership and participation in the network. Yet they also have additional ideas, cultures, customs, and activities that are not shared, and some may be fraught with dissonance among other network members, especially when considering connections beyond those of the first-order—friends of friends and the like.

**Membership in Networks**

Unlike groups, for networks to operate effectively, participation needs to be as freely and widely accessible as possible. For this reason, the P2P Foundation uses the term “equipotency,” which implies that each member of the network has the potential and power to participate in the network (p2pfoundation.net/Peer_to_Peer). Network participants have ample opportunity to witness the network’s dependence on participation from large and diverse populations. The culture that evolves within the network therefore emphasizes openness and invites contributions from as wide a population as possible. Further, networks encourage members to join and participate in other networks, thereby providing conduits to cross-pollinate and invigorate existing ones.

Participation on the physical level is open to all who have access to cyberspace—a capacity nearly universally available in developed countries, but sadly unequally distributed in some developing countries at the present time. However, with the development of very low-cost hardware, the increase in portable and handheld devices, and the deployment of machines with mesh networking, we can expect physical access constraints to decrease rapidly in the near future. Nevertheless, network value may also be restricted to those who are able to adapt to the fluid culture, languages, and linguistic clues that are used to sustain networking cultures. Those whose technical skills are very limited, who harbour a deep distrust of network technologies, or who are comfortable only in highly visible and defined hierarchical organizations may find networking contexts both frustrating and suspicious.

Equipotency also speaks to the power of network members to define the extent of their participation in a particular network. Since networks offer a wide variety
of participative roles, members must decide for themselves what roles they wish to play and be able to amend them as desired. They are free to define the extent of their participation, and to adopt roles of leadership, support, encouragement, or silence as required. Equipotency assumes a deep respect for democratic ideals, in that network members are free to define their own expectations and practice, while respecting the rights of others to do so as well. This freedom is not anarchical, though. Participation in the network requires a shared commitment to a common interest, goal, or activity of the network. Network members come to understand through observation that the realization of their object of cooperation will happen when they coordinate and distribute their activities, skills, and talents in effective ways. Thus, organization, leadership, planning, and coordination evolve within the network and are viewed as legitimate means of achieving network goals.

**NETWORKS AND SOCIAL CAPITAL**

Social capital has long been seen as an important facilitator and indicator of readiness for social activity. Through collaborative interaction, action, and discourse, groups and networks build social capital. Resnick notes that “use doesn’t use it up; when a group draws on its social capital to act collectively, it will often generate even more social capital” (2001, p. 2). The social capital thus created empowers both individuals and their network(s), affording them increased opportunity, capacity, and a sense of efficacy that are used for subsequent individual and social actions.

Burt (2009) focuses on the value accrued to the individual by the exploitation and growth of their social capital. He discusses the role of a broker, someone who spans two groups or networks and serves as an introductory facilitator for more extensive social, and often, economic transactions. While Burt’s work is especially relevant to business-oriented networks such as LinkedIn, it also points to the role of the teacher as one who brokers connections—not only to content, ideas, and facts, but to individual groups, networks, and collectives who can be called upon to expand and apply the ideas studied.

**DESIGNING NETWORK APPLICATIONS**

There are many books, websites, and papers that purport to provide formulae and techniques for designing successful social networking sites. While we will be highlighting some of the more obvious common features of these, our intention here
is to focus on those that are significant in a learning context. Successful network-based learning is not just about building large numbers of connections (as in, for example, Facebook or LinkedIn), though numbers do matter (Rainie & Wellman, 2012). It is more about building systems that make it possible to gain the greatest value in a particular learning context. A small network of the right people is far more valuable than a large network of those who will not provide much help, although it is true that the chances of finding that small network are higher if we are more networked in general.

The looser aggregation of networks compared to groups leads to its own set of design problems. Networks do not, by definition, involve the same levels of commitment and purpose that define groups, do not have the same social hierarchies and structures that bring comfort and security in groups, and are less tightly controlled and defined. Indeed, most do not even have a name and, when they do, it is a label more than a definitional term.

**Design to Encourage Participation**

Unlike groups, there are seldom external structures and social clusterings that drive the membership in learning networks. While membership in a group may be the precursor for the formation of a computer system to support it, networks tend to arise through participation from the ground up. It is certainly possible to intentionally seed a network, but it is usually not so easy to define its membership in advance. It is therefore important for any software and surrounding systems designed to support networks to pay close attention to making participation (as well as ending participation) as easy and painless as possible.

Some aspects of encouraging people to join a network are mainly a marketing concern: if the intention is to seed its growth, the purpose of the network should be clearly stated, well-advertised in the right places and, more than anything, the right people should be encouraged to join, remembering both Reed’s law and Metcalfe’s law: individuals should be well-connected, well-known, or both. Some are a matter of design for applications to support the network:

- Make the process of joining clear: make the joining and login process simple and well-signposted;
- Make the process of joining simple: use of OpenID, Facebook Connect, simple forms, or progressive engagement. (Porter, 2008, p. 93)
Design to Encourage People to Stay
While much of the dynamics of a network application are determined by the interactions of people within it, there are many things that may be done to make it more likely that networks will persist and thrive. Techniques such as sending push reminders about new content via email, notifications when a user’s content has been “liked” or commented upon, tools such as recommendation or referral systems to sustain network growth, and above all, making compelling content easy to find can help here.

Design for Change
Evolution occurs as much in groups as in networks but, commonly, the evolution of groups is an intentional process that at least passes through, if it is not derived from, the higher hierarchical levels of control within. In the network, the meaning of the word “evolution” begins to shift far closer to the specialized Darwinian notion of the term.

CONCLUSION

In this chapter we have seen that, though some of the tools may be shared in common with groups, networks are a very different social form, one that is fuzzy, bursty, emergent, and unbounded. Central to this difference is that fact that networks impose different and fewer structures and methods on their members, which means that they play a far more significant role in determining their own course of learning. Perhaps ironically, this most centrally social of forms is focused almost entirely on the individual and that individual’s relations with others in the network.