ABSTRACT

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Formal training is often presented as a straw man in support of informal learning as an idealized form of organizational learning. This research examines the connection between co-participation in a formal training program and the informal learning networks within an organization. This study provides evidence, through an examination of social identity theory and the inherently social nature of informal learning, that there is a lingering sense of cohort from participating in a training program together. This study used a social network analysis to examine the effect that training co-participation had on informal information seeking and three antecedent variables found by Borgatti and Cross (2003)–knowledge, value and accessibility. A network of 27 professionals in a marketing firm participated in an online survey asking about their information seeking behaviors and assessments of one another’s expertise. A multiple regression quadratic assignment procedure showed that co-participation had a statistically significant influence on information seeking, knowledge of expertise, valuing expertise, and assessment of accessibility. While the results were small, training co-participation was the only variable other than proximity that had an influence on information seeking and its antecedents. The results suggest that outside of imparting knowledge, skills and attitudes, formal training also serves a role in the social learning that happens every day within organizations.

Keywords: informal learning, social network analysis, social identity, information seeking
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The Influence of Formal Training on Informal Learning Networks

by

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DEDICATION

For Dad, who never finished high school because he had to support his family. Your work and example drove me all these years. I hope you are proud of what I accomplished. I really wanted you to see this and I miss you.
BIOGRAPHY

Joe Houde is an educator, designer and consultant specializing in innovative educational design and corporate education. He has over a decade of experience in corporate education and is currently founder and president of Brass Ring Training.

Joe's expertise lies in connecting content, design and participants. He applies this expertise primarily to programs focusing on strategy, organizational culture, and leadership development. Joe has lead the design of several Duke Corporate Education Metaphoric Experiences™ which use novel contexts to teach business lessons. These include Make the Play, which is based upon Duke basketball and highlighted in Newsweek magazine, and On Trial!, an activity that uses a simulated courtroom to encourage robust dialogue. He has designed and delivered traditional programs, simulation-based programs, Metaphoric Experiences™, experiential learning programs, action learning programs and online e-learning for both international and US based programs. His clients, among others, include: Deutsche Bank, PricewaterhouseCoopers, IBM, Glaxo Smith-Klein, Microsoft, Eli Lilly, Duke University, Suncor and Siemens.

Prior to founding Brass Ring, Joe worked for Duke Corporate Education as a facilitator and facilitator relationship manager. His role was to develop a network of practitioners and core educational methodologies for the company. Before 2000, Joe was a freelance facilitator designing experiential learning and working with action learning teams. He worked with the Executive Education department at the Fuqua School of Business, facilitating strategy simulations and 360 feedback. He also taught the online section of the
Corporate Strategy class for the Duke MBA-Global Executive program. Joe currently has a course in Game Design and Learning which he co-teaches at North Carolina State University. Beyond working with clients, Joe works to progress the field of corporate education and has made presentations on design, leadership and education at world-class institutions such as the Center for Creative Leadership in Greensboro, NC and IMD, in Lausanne, Switzerland. For a brief time, Joe worked in the entertainment department on a cruise ship.

Joe has worked with clients from diverse industries including manufacturing, accounting, consulting, financial services, banking, energy, petroleum, transportation, automotive, consumer electronics, entertainment, software, medical, higher education, publishing, pharmaceuticals and not-for-profit. He has facilitated and taught in programs in a dozen countries around the world, including South America, Asia and extensive work in Europe.

Joe received a Masters in Training and Development from North Carolina State University and was a Drew Scholar at Drew University, where he earned a Bachelor’s degree in Psychology with a minor in Asian Studies. Joe's research focuses on non-traditional education and learning methods: game-based learning, apprenticeship in professional services, informal learning networks, and online learning. His master’s thesis was published in the Academy of Management Learning and Education Journal in 2007.

In winter 2012, Joe launched a podcast series focusing on learning, expertise and leadership. His series includes three podcasts: How experts learn, Expert Teachers, and Leading as Teaching. His podcast and blog can be found at brassringinc.com.
Joe is married to Dr. Leah Houde and the proud father of Alex and Victoria Houde.

He resides in Durham, NC.
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Chapter 1

Informal learning is difficult to define. Because informal learning is ubiquitous and hard to quantify, research on the topic is diverse and sometimes contentious. Researchers cover topics as varied as to how work can be shaped to improve learning (Skule, 2004), how learning occurs within organizations (Eraut, 2003), and how informal learning and training interact (Enos, Kehrehan, & Bell, 2003). Not only do the topics covered by informal learning research vary widely, but the challenges of globalization, technology and demographic shifts have increased interest in informal learning as a potential solution.

As the interest in informal learning has grown in both volume and diversity, it has coincided with an increase in critiques of formal training. These critiques center on how formal training removes learners from the situated context of learning, is too costly compared to alternatives, and is less efficient than alternative technological options that allow for ‘just-in-time’ learning. However, many of these critiques erroneously hold to the same assumption that Paulo Friere (1970) attributes to traditional education—a fascination with content transfer at the expense of the context of learning. Friere called this the ‘banking education’, where the purpose of education is to make ‘knowledge deposits’ in a way that minimizes the involvement of the student and his experience. While a given formal training program may or may not have this banking education model, it does have a social context. Students create a social context among themselves and the educator, informed by their own past experiences in classrooms. So while it is true that formal training does not occur in the context of application, formal training does not exist outside of all context. The individuals in the training bring a personal history with classrooms, and each training program creates its
own sense of event and community. In other words, formal training has a context of its own, and that context has potential consequences for informal learning.

Even as e-learning and just-in-time learning gain in popularity, formal training with primarily a classroom component brings people together for the purpose of learning. In the discussion of organizational learning, bringing a group together for training is often ignored, or even criticized for its cost. However, research about groups suggests that being together and sharing tasks and experiences creates a shared and enduring sense of identity (Sherif, et al., 1954). This shared sense of identity is an important consequence of training when comparing it to informal learning. That is because a shared sense of identity has effects on social interactions, and informal learning behaviors are at their root social interactions. This shared sense of identity is often overlooked by researchers interested in training effectiveness, likely due to the paradigm of effectiveness being measured as knowledge, skills, attitude (Baldwin & Ford, 1988). Shared identity does not fall easily into any of these categories, and consequently is overlooked.

Problem Statement

According to Marsick and Watkins (1997), Informal learning is "a process of learning that takes place in everyday experience" (p. 218). Because of its mundane nature, researchers have tended to consider informal learning a form of situated learning, framed as a natural aspect of participation in work activities (Lave & Wenger, 1991). Situated learning is inherently social learning: the interpersonal context of learning is considered an essential part of the process. Up to this point, researchers examining informal learning in an organization
have focused on this interpersonal context. To increase learning, qualitative changes in work activities have been suggested, such as increased access to challenging work, access to different workers, and more regular feedback (Skule, 2004). The proposed solution to increasing informal learning is consequently centered on aspects of the work environment.

Eraut (2004) suggests some specific social activities that are part of the context of informal learning. In a study of hospital staff, Eraut found that informal learning typically occurred in active social contexts where the key driver of learning is the interaction between co-workers. Informal learning fell into four broad categories: participation in group activities, working alongside others, tackling challenging tasks, and working with clients. Group activities include working to a special purpose in a group formed specifically for that task. Working alongside others encourages learning through modeling and observation. Challenging tasks require learning to achieve success. Working with clients results in learning about the clients, their problems, and the learners’ own organization. Group activities, working alongside others and working with clients are all explicitly social. Challenging task are also social in Eraut’s (2004) taxonomy since, when they are successful, such tasks tend to be well-supported by coaching.

Considering informal learning a matter of interpersonal relationships makes evaluating it across an organization a challenge. Relationships within organizations are factors of not only the individuals in the relationships, but also the organizational contexts. Most of the research on informal learning uses qualitative research or a series of quantitative but individual-focused surveys. These methods provide useful information on informal learning and the organization (e.g. Marsick and Watkins, 1997; Skule, 2004) but a third
method provides a better way to analyze informal learning within the organization as a whole and the sub-groups of the organization. This method is social network analysis. Social network analysis gathers data on the relationships between all the members of the organization, enabling a portrait of groups and sub-groups to be created both visually and analytically. In social network analysis the relationship, not the individual, is the unit of analysis. As such, groups are represented by the qualities of the connections between people. This allows researchers to examine ‘purchasing relationships’, ‘trust relationships’, or ‘learning groups’.

Borgatti and Cross (2003) have studied information seeking behavior using social network analysis focusing on ad hoc information exchange within organizations. This study involves looking at questions of why people seek information from other people. It examines the traits of the seeker, information source, and the organizational characteristics that promote or detract from information seeking. Borgatti and Cross (2003) suggests that three characteristics of the relationship between information seekers and person they ask for information influence the likelihood of asking for help: knowing a person’s expertise, valuing the person’s expertise, and accessibility of the person. Borgatti and Cross (2003), moreover, found that these relational factors mediate propinquity as a determinant in information seeking behavior. In other words, if I know your expertise and think you will respond to me in a timely manner, that will influence me to seek your help, whether you are conveniently nearby or far away. Their research does not explain how the knowledge, value, or sense of accessibility is developed, but they do suggest that the information-seeking process itself provides data for the future decisions of information seeking. The model that
they propose at the end of their 2003 article shows a recursive loop between successfully seeking information and the relational factors that increase the likelihood of a certain person being asked for information.

Informal learning is an important part of a training department’s strategy. In arguing for the potential of informal learning, advocates dismiss formal training. This dismissal is unfortunate without any empirical support for a lack of connection between formal training and informal learning. Because formal training and informal learning are set up as an artificial dichotomy, the potential connections between them are regularly overlooked. So far, no work has been done to examine these potential connections. Social network analysis provides a method of examining the influence of formal training on informal learning in organizations.

**Purpose**

The purpose of this study is to examine the effect of formal training on social factors significant to informal learning. The specific factors examined are the relationships that form a ‘hidden’ informal network within the greater organizational learning network as well as an increase in antecedent attitudes (i.e., Knowing and valuing expertise and feeling others are accessible) that foster this informal network. Figure 1 shows the traditional understanding of the effect of formal training and informal practices on workplace learning. This diagram summarizes research done by Tannenbaum (1997) that found that only 20% of learning is attributed to formal instruction, while 80% of it is due to on-the-job training and interactions with supervisors, colleagues, and other people. Of the 80% of learning attributed to informal learning, 40% is based on relationships.
Figure 1 Standard Training Assumptions

Figure 2 shows my proposed relationship between formal training and informal learning. Formal training influences the relationships that are such a substantial part of informal learning. Figure 2 also introduces several new variables in the training effect process. In addition to the traditional effect of training individual learning, this model proposes that training will create an increase in the sense of knowing, valuing and attributions of accessibility in the training cohort. This will increase the likelihood of informal knowledge seeking within the cohort and, consequently, increase an individual’s learning after the program.
Figure 2 Proposed Relationship Between Formal Training and Informal Learning

Figure 3 illustrates the focus of this study. Due to the complexity of evaluating learning after a training (cf., Kirkpatrick and Kirkpatrick, 2006), the question of effect of formal training and informal learning on individual learning is not a part of this research. The process of evaluating the effect of training on learning is very involved and has been
pursued extensively by other researchers (cf., Tharenoe, Saks, & Moore, 2007; Baldwin & Ford, 1988). The questions of interest in this study center around the effect that formal training has on informal learning and some of its antecedents.

*Figure 3* Focus of current Study
This study is an extension of the work in Borgatti and Cross (2003). They propose that social network analysis is a viable tool for examining organizational learning. In their study, they looked for antecedents to information seeking at work as a way to understand the relational aspects of organizational learning. Relational information seeking is an aspect of informal learning (Eraut, 2004) in organizations and has been traditionally difficult to examine because of nature of informal learning: ad hoc, embedded in work contexts, and spontaneously motivated. Borgatti and Cross (2003) avoid this issue by asking for information seeking behavior, a practice that is easier to recall and less likely to be limited by mental models of traditional, classroom-based learning. Questions explicitly about ‘learning’ are limited because of the likelihood that participants would tend to focus on classroom experiences instead of organic informal experiences. Eraut (2004) notes the problem with asking about learning, saying that “most respondents still equate learning with formal education and training, and assume that working and learning are two quite separate activities that never overlap.” (p.249) As such, a network analysis of information seeking may provide greater insight into learning than an explicit examination of learning.

Hypotheses

This study examines and compares training cohorts within a small New England-based professional services firm organization, creating a map of learning connections and the map of cohorts as a sub-group. Inferring from the social identity research, informal learning (measured by information seeking) should occur more frequently between co-participants of training programs. This leads to hypothesis 1:
**H1**: The extent to which actor i seeks information from actor j is a positive function of actor i and actor j participating in a training program together.

Borgatti and Cross (2003) describe three antecedents to informal knowledge seeking in organizations. These three variables are: knowledge of a person’s expertise (knowledge); value of a person’s expertise (value); and attribution of accessibility (access). Social identity theory suggests that two of these antecedents should be increased due to co-participation in training.

Ingroup effects on attribution should influence value and access. Value and access are evaluative variables, which make them susceptible to ingroup biases. Research in ingroup bias for valuing input (Mackie, Worth, & Asuncion, 1990) suggests that training cohorts will value each other’s input more. Accessibility is partially a measure of willingness to help, and helping behaviors are also subject to ingroup effects (Dovidio, et al., 1997). These factors lead to the next two hypotheses:

**H2**: The extent to which actor I values the expertise of actor j is a positive function of actor I and actor j participating in a training program together.

**H3**: The extent to which actor i perceives he or she has access to actor j is a positive function of actor I and actor j participating in a training program together.
While social identity theory does not necessarily suggest that sharing time together will increase knowledge of expertise, an intuitive understanding of cohorts does. Increased exposure to others should provide an opportunity to know their area of expertise. Hypothesis four follows from this.

H4: The extent to which actor i knows the expertise of actor j is a positive function of actor i and actor j participating in a training program together.
Chapter 2

Literature Review

The main argument behind the hypotheses for this study is that sharing a class together increases the likelihood of sharing information back in the workplace. Imagine a group of mid-level executives, spread across an organization. They all participate in a training program intended to make them better leaders or understand implementing the corporate strategy or being better negotiators. This cohort spends a day or two together learning the new behaviors and knowledge in the program and then each member goes back to their work. Often, a stated benefit from a program like this is ‘networking’. How does this work? The argument I make in this dissertation is that it works this way: being together creates a shared sense of identity. This shared sense of identity increases the informal learning through information seeking from peers, creating a learning network that helps the cohort members. This argument breaks down into three main parts which will be the structure of this literature review: sharing a training course together and its effect on assumptions; information seeking and the antecedents found by Borgatti and Cross, and information seeking as an informal learning behavior.

Sharing a Cohort and Social Identity

Research into cohort effects in learning have focused on the extended cohort in graduate programs (e.g., Reynolds & Sitharaman, 2000; Lawrence, 2002; Imel, 2002) rather than corporate training programs. This research has found that cohorts find benefits including increased affective learning (Reynolds & Sitharaman, 2000), increased
development of critical thinking skills (Chairs et al., 2002), and increased motivation to learn (Brooks, 1998).

Unfortunately for this dissertation, these previous research studies define cohorts in a way that does not correspond to the realities of corporate training. The researchers define cohort based on a lengthy time together and a lockstep progression through multiple courses (Reynolds & Sitharaman, 2000), a small group completing a degree as a unit (Lawrence, 2002) or a group that enrolls at the same time (Imel, 2002). All of these definitions are anchored in a process that keeps participants together over an extended period of time. This arrangement is far less common in organizational settings. In this research, cohort will be defined in accord with a more inclusive definition as any well-defined group (Merriam-Webster, 2011). As such, any training program has a cohort of participants.

This definition of training cohort leaves a problem of defining training itself. Training programs are often referred to but rarely defined in the literature. While program planning is a thorough area of research in adult learning, the program itself is left as an assumed quantity – some time spent in a classroom, with an instructor and a group of learners. For the sake of this research, I will adopt Marsick and Watkins description of formal learning as a working definition of program. Marsick and Watkins described formal learning as “institutionally sponsored, classroom-based, and highly structured.”(1990, p. 12) In the corporate realm, this includes those learning activities that involve taking time away from work and joining others in a separate space in order to participate in a pre-designed course.

A training program seems like a poor candidate for creating a cohort effect. Most
training programs last a day or two at most, and the outcomes tend to be focused on individual achievement and goals, rather than an over-arching group achievement. However, research in social identity makes an argument for the training program’s effect on the social interactions of participants. Specifically, social identity theory shows that sharing experiences as well as minimum social cues can create beneficial biases in regard to availability, persuasiveness, and openness. Each of these is an antecedent to knowledge seeking in the organization.

Social Identity Theory History. Social Identity Theory (SIT), developed by Tajfel and Turner (1985; Tajfel 1978, 1981; Turner 1978, 1982, 1991), argues that people tend to classify themselves and others according to various categories - gender, nationality, organizational membership, etc. This theory addresses how people develop social identity, the consequences of social identity in society and social identity in the organizational context. In this review, I will examine social identity theory in general and focus on the specific aspects of the theory that suggest it as a mechanism for the impact of formal training on informal learning networks.

SIT asserts that individuals compose a self-concept from a combination of personal identity and a social identity (Tajfel & Turner, 1986). The personal identity is all of the idiosyncratic features of the person, while the social identity includes salient group classifications. Ashforth and Meal describe social identification as “the perception of oneness with or belongingness to some human aggregate.” (1999, p. 21) Tajfel and Turner (1986) posit that the distinction between personal and social identity help understand the difference between interpersonal and group situations. The social identities allow people to sort themselves and
others into categories that are defined by the prototypical characteristics of the members of a group (Turner, 1978). This categorization helps to segment the social landscape as well as enable an individual to locate himself within the landscape.

Early research in group formation and shared identity showed how sharing tasks and time spent together has an effect on social identity. One of the first and most memorable experiments in social identity was the Robber's Cave experiment. Sherif, et al.‘s (1954) experiment in Robber's Cave State Park in Oklahoma involved 22 boys taken into the park for a 3 week experiment that would develop ingroup and outgroup categories, explore the consequences, and then work to dissolve those categories.

The experiment began with a one-week period where two groups of 11 boys each camped within Robber's Cave unaware of each other's activity, but aware of the existence of the other group within the park. Each group was accompanied by observers who acted as camp staff. Each group stayed in a cabin and worked through the mechanics of camping: cooking, cleaning, building fires, finding and securing a swimming hole. The groups developed a sense of shared identity through this work, to the extent that the groups named themselves the Rattlers and the Eagles and each decorated clothing with their team names.

Sherif, et al. (1954) were interested in more than social identity and spent much time observing the internal hierarchy develop as well as the actual achievements of the two groups. For the purposes of social identity research, it is only useful to note that both groups had similar levels of success in specific tasks (starting fires, canoeing, sports) and that internal hierarchies established during the first week.

Stage 2 of the experiment involved explicit and implicit competition between the
Eagles and Rattlers. It began when the counselors made the groups aware that another group was in the park with them. From this point, the boys from both groups asked for a competition with the other group. The Rattlers found that the Eagles use of shared resources such as the baseball field felt like an intrusion, despite the fact that they had yet to actually interact with the Eagles. Their knowledge of the Eagles use of the field was from hearing them play at a distance. The experimenters developed a tournament of activities including head to head activities and hidden activities that allowed them to manipulate the competition and keep it close throughout the week. During the week of events, both groups took meals together where they were informed of the current score in the competitions.

During the competition, the interaction of the two groups was acrimonious. The first encounter included insults being thrown from the beginning and escalating as the baseball game they were engaged in progressed. A degrading of interactions hallmarked the entire week. Sportsmanship started out at a respectable level, but diminished to the point that losing teams would not shake hands and at one point each team burned the team flag of the other. Other interactions included raids by each group on the other's cabin and an eventual naming of one another as "The Enemy."

The final stage of the experiment involved creating events to diffuse the intergroup conflict. The method that the researchers chose first was to increase interaction without any explicit competition. Sherif, et al. hypothesized that this would not change the group dynamics and this hypothesis was supported. A change in behavior was achieved by creating superordinate goals which aligned the interests of the two groups. The first goal was created by a fabricated shortage of water. The two groups needed to cooperate in order to fix a
sabotaged water pipe. Later, they needed to cooperate in order to have a successful overnight trip to another camp ground where meal preparation, tent pitching and jump starting the truck that brought them on the trip. Through these interdependent goals, the two groups began to merge. The original identities of Rattler and Eagle did not disappear entirely, but hostility was eliminated to the extent where one group offered prize money from a camp contest to purchase malts for the other group.

Sherif, et al. (1954) were primarily interested in intergroup conflict, but the research fed much of the following work on social identity, including the paradigm of shared goals and shared practice being the key drivers of social identity. The research has moved beyond this idea, to examine how even a limited relationship creates social identity. The current model of social identity theory posits that individuals feel a connection to a group without regard to shared goals or shared fate. An example of this is a sports fan using the phrase “We won” to describe the outcome of a game she watches. (Ashforth & Mael, 1999) Another feature of social identity is that a given individual will identify with multiple groups, with varying degrees of identification for each group. Not only are these group identifications in various levels, but the salience of a specific group identification can be situationally triggered (Brewer & Gardner, 1996) For example, the previously mentioned sports fan will think of herself as a fan first and a professional second when at the game, but in the office, her professional identity will rise to the top and her fan identity will be less significant. SIT also asserts that identification is a social referent. Self-identification with a group allows the individual to categorize their own values and behaviors within the context of an in-group and distinguish that from other out-groups. (Turner, 1982)
Minimal Cue Paradigm

Although Sharif, et al. (1954) suggest that the shared time and goals formed the group identities in their study, Tajfel, et al. (1971) showed how small a cue was needed to form ingroup preference. In two separate studies, they had participants grouped at random but with a stated association due to either art preference or accuracy of dot counting. These groups were put on a task of distributing a small cash prize to others, with no individual capable of giving themselves a benefit.

In both experiments, the participants gave members of their own group preferential treatment to members of the other group, even though it was arbitrarily designated. When the data were analyzed for possible strategies, the likelihood of maximum ingroup benefit was less than the likelihood of maximum difference in group treatment. In other words, the participants were more likely to make their group better off than the other group rather than make sure their group had the highest possible gain.

This study shows two main points. First of all, how small a cue is necessary to create a sense of ingroupness. In this case, the differences were based upon assumed similarity in artistic taste or an arbitrary skill. The results of this test were replicated in later studies using other groupings including preference for online doodles (Amichai-Hamburger, 2005), colored armbands (Rabbie & Horowitz, 1969) and even openly random selection (Tajfel & Billigs, 1973) Secondly, this study shows that when given choices, participants would prefer accentuating differences over trying to maximally benefit the group. This is important, as the idea of ingroup preference can be inferred to be more concerned with distinction of groups than an economic desire for maximal utility.
Consequences of shared identities.

SIT shows that group identity forms with little commonality needed and specifically without a need for shared goals and fates. While this quick group identity was originally measured by preferential treatment with economic benefits (e.g. Tajfel, et al. 1971), other effects of social identity have been found as well. Three of these effects have direct relevance to the examination of social identity’s effect knowledge sharing.

Rabbie and Horowitz (1969) examined the effect on social identity of winning or losing a prize and discovered that regardless of loss or win, ingroup preference created an assumption of openness and responsibility. They ran an experiment where groups of teenage participants were divided arbitrarily and asked to evaluate one another after the experimental condition was presented. In the control, nothing was done between the preliminary stage and the evaluation. Three experimental conditions varied the cause of differing experiences and rewards between the groups. In the first condition, a prize was awarded to one team by the toss of a coin. In the second, it was awarded by experimenter fiat. Finally, the third condition was awarded based on a quicker response by one team. In fact, the third condition was also arbitrary.

In the experiment, the participants were divided into two groups, each with a color code. Both groups were given color coded name badges, pens to write with, and were regularly addressed by their group color names. The groups were placed on opposite sides of a room divider to minimize intergroup interaction. Participants were administered a hidden patterns test, asked to fill out personal information surveys, and asked to rate photos of people on traits they would later evaluate in other participants. The divider was then
removed and the participants were asked to introduce themselves by reading the survey information. Following the introduction, participants were asked to rate one another individually and as groups.

This experiment resulted in a clear difference between the control group and all of the experimental conditions. In each experimental condition, Rabbie and Horowitz (1969) noted that participants viewed their own group as more desirable to belong to, less likely to be hostile and more familiar. Notably the experiment involved no real interaction within or between groups. Participant teams were placed on either side of partition until mutual evaluation and the task involved no ingroup interaction.

Besides group evaluations, Rabbie and Horowitz had participants document interpersonal evaluations of other participants. In these evaluations, participants were more likely to find that ingroup members were more open and responsible. These evaluations are also attributed to the shared identity from the color coding, as there was no real interaction intragroup or intergroup.

Another effect of shared social identity is increased disclosure and an increase in helping behavior. Dovidio, et al. (1997) examined how self-disclosure was effected by ingroup and outgroup associations. They manipulated the grouping in a minimal way similar to other experiments: seating arrangement, labeling and attire. The groups participated in a simulated survival activity. The two conditions in the experiment were a unified group and a divided group. After the survival activity, tests for helping and for interpersonal disclosure were given. The experimenters found that people were more likely to reveal personal information to one another when in the single-group condition than in the multiple-group
conditions. They attributed this to a drive to find a substantive connection for the arbitrary grouping. The participants were trying to make a reason for being a group by finding commonalities other than seating or labels. With helping behavior, the researchers found that interpersonal factors did not have any significant impact on helping behavior, while ingroup status did. This result points towards help based upon ingroup status.

Researchers have extensively examined the effect of shared social identity on valuing information (Festinger, 1950; Kelman, 1961; Turner, 1982). Mackie, et al. (1990) explored this phenomenon by examining the interaction of ingroup preference, strength of argument and relevance of argument. They ran an experiment evaluating the impact of arguments for certain causes such as offshore drilling. The experimental condition was where the information came from – in one condition the information came from students at the same university as the participants, and in the other condition the information came from students at a different, distant university. The arguments from the ingroup (same university) were evaluated on persuasiveness based upon their relative merits – strong arguments were very effective, while weak arguments were only partially effective. However, all of the arguments from the outgroup (different university) were evaluated as unpersuasive, whether they were strong or weak. These effects were replicated, and further refined. In a second experiment, the persuasiveness of an argument was not only based upon the ingroup status, but the direct relevance of the issue to the definition of the ingroup status. In this case, the subjects were exposed to environmental arguments that were local in nature (drilling offshore) or specific to a distant locale (acid rain on the Canadian border). When the local situation was presented, outgroup messages were unpersuasive and ingroup messages were evaluated on
their merit. With the distant situation, ingroup arguments were persuasive regardless of quality and outgroup messages were again universally unpersuasive. These results lead Mackie, et al. to conclude that ingroup bias increases the relevance of an argument, whether the argument is a good one or not, and when arguments are relevant (e.g. local issue), ingroup bias increases the persuasiveness of the arguments.

Pettigrew (1979) proposes an ‘ultimate attribution error’ which he describes as “a systematic patterning of intergroup misattributions shaped in part by prejudice” (p. 464). This ultimate attribution error is an extension of the fundamental attribution error (Ross, 1977) to the group level. The fundamental attribution error states that individuals will attribute favorable outcomes to individual traits (dispositional) and unfavorable outcomes to the context (situational) for themselves. Meanwhile, for others the effect is the opposite: favorable results are situational and unfavorable ones are dispositional. Pettigrew extended this to the group level, arguing that ingroup success was attributed to disposition while outgroup success was situational. Likewise, ingroup failure was situational and outgroup was dispositional. The ultimate attribution error was extended into the group attribution error (Allison & Messick, 1985). The group attribution error states that for the ingroup members, favorable outcomes are due to disposition and unfavorable outcomes do to the situation. For outgroup members, favorable outcomes are attributed to the situation and unfavorable outcomes to disposition. A review by Hewstone (1990) showed mixed support for this attribution error. Hewstone examined 19 studies in intergroup attribution and found that attribution effects were likely to be positive towards ingroup members, but less likely to be negative towards outgroup members. Positive ingroup attributions were extensive but not
universal in the 19 studies, while outgroup attributions were inconsistent across the studies. Finally, ingroup and outgroup attributions were more evident when group boundaries are made salient in the experimental design.

These examples show how social identity effects the evaluation of others in many ways, almost all beneficial for ingroup members. Group members favor their ingroup in resource allocation (Tajfel, et al., 1971). Ingroup effects make group members more likely to have a favorable assessment of fellow group members, even with limited information (Rabbie & Horowitz, 1969). Ingroup effects result in more favorable assessment of persuasiveness of arguments from ingroup members (Mackie, et al., 1990) and a higher likelihood to reveal personal information (Dovidio, et al. 1997). Ingroup biases are complex in effect and still unclear in process. These biases are extant in organizations (Ashforth & Meal, 1989) as well as society at large, and the effect they have on complex dynamics such as learning warrant exploration.

**Relational View of Information Seeking**

In order to examine the effect of shared social identity on informal learning, I first need to explain the model I have chosen for measuring informal learning. This model examines information seeking behavior, which will be shown to be a key art of informal learning.  Borgatti and Cross researched the antecedents to information seeking in organizations (2003; Cross & Borgatti; 2000, Cross & Borgatti, 2004). This research started with a qualitative examination of the traits of the relationship between knowledge seekers and their knowledge-giving partners. Borgatti and Cross (2003) took these qualitative results and examined them through a social network analysis of two groups. The results supported
all but one of the conclusions in the qualitative research.

Presented at an academic conference in 2000 and published in 2004, Cross and Borgatti use qualitative research methods to examine the relational characteristics that influence who seeks information from whom. They argue that there are three main ways to examine information seeking in dyads: as a factor of the attributes of the seeker, the attributes of the source, and the attributes of the relationship. The nature of the information seeker has been examined in research that looked at gender and information seeking (Ibarra, 1993) and motivation of information seekers (Lee, 1997). Examples of the nature of the information source being examined include the differences in accessing a human or archival source (O’Rielly, 1982) and performance feedback (Ashford, 1993). The only research on relationships that they uncovered focused on the strength of ties (Granovetter, 1973) and not the characteristics.

Cross and Borgatti (2004) examined the relational characteristics that influence information seeking through a series of interviews with employees in the consulting branch of a national accounting firm. The researchers collected data in an iterative process that allowed for integration of previous results into subsequent interviews. Participants were asked to reflect on significant projects in the previous six months and write down the names of people they turned to for information during the project. The researchers then focused the interview on the three most important people that the participant chose from this list. Cross and Borgatti interviewed 40 managers, resulting in 120 relationships explored (3 for each manager).

Through this qualitative research, Cross and Borgatti (2004) found four relational
characteristics that contributed to the likelihood of looking for information from someone: knowing that the informer has the information needed; being able to access the informer; valuing the informer’s input; and a relationship that felt safe to the information seeker. These results were translated into the variables of knowing, access, value and cost in the quantitative research of Borgotti and Cross (2003).

Borgotti and Cross (2003) examined the social networks of two groups in different global pharmaceutical firms. Both groups were scientists doing research. One group did research on new pharmaceutical applications and the other did supporting research that enabled drug development. Both groups were geographically disperse and demographically diverse along gender and racial categories.

Each member of both groups was asked the same network questions about the other members within their networks. These questions come from the conclusions of Cross and Borgatti (2004) and are labeled as information seeking, knowing, value, access and cost. Knowledge seeking is the dependent variable in the study, and was measured by asking both how often a respondent sought information from actor b and how often actor b sought information from the respondent. This double measure – from the seeker and the informer – results in a more accurate variable for information seeking (Borgatti, et al., 1999) than simply asking one party.

Knowing is related to how well an actor in a network is aware of the expertise of the particular actor they are seeking information from. A fundamental requirement for looking to someone for information is that the other person potentially has the information required. Borgatti and Cross relate this variable to the literature on transactive memory systems, which
focuses on the distributed knowledge within a group and how it is accessed. Knowledge of others’ expertise is a standard variable of analysis in transactive memory (Weick & Roberts, 1993).

Besides a perception of knowing the level of expertise the potential informer possesses, Borgatti and Cross hypothesized that the information seeker must value the expertise of the informer. This is a measure of the perceived quality of the information that the informer may have. Borgatti and Cross (2003) note that “this variable has not been previously identified in the transactive memory literature” (p. 434) and attribute this to the laboratory-controlled nature of most transactive memory research. They note that the decision process is different when considering impersonal or personal information sources. People chose personal sources based significantly upon the perceived quality of the source where impersonal sources such as databases and websites are chosen because of convenience (O’Rielly, 1982).

Along with knowing and valuing someone’s expertise, an assessment of accessibility influences the decision to seek information from them. Accessibility is a factor of the relationship and a factor of timeliness. The information seeker must be able to contact and communicate with the informer within a timeframe that allows her to use the information in the relevant problem. Borgatti and Cross (2003) argue that the technological barriers to accessibility that were predominant in the past – distance and signal loss – are not as relevant with the advent of modern communication technology. Access in modern organizations, they argue, is “increasingly likely to be a product of the relational energy one has to expend” (p. 435).
Cost is the final relational characteristic that Borgatti and Cross address in their study. The cost involved in information sharing is perceived as a sense of obligation and interpersonal risk. Obligations based on reciprocity norms may appear as a cost. Requests that are seen as impositions may place the information seeker in debt to the informer (Blau, 1986). The risk is the risk of admitting ignorance in an area of importance, or a loss of prestige from not resolving an issue on one’s own.

Borgatti and Cross surveyed both research groups, using a complete network analysis strategy. The complete network analysis attempts to survey all the relationships within a network in order to describe details of the entire network (Wasserman & Faust, 1994). This is in contrast to an egocentric network analysis that measures networks from given individual perspectives.

The results of the study are summarized in Table 1. Of the control variables, only physical proximity was a predictor of information seeking. Also, of the four independent variables, all but cost were found to correlate with information seeking behavior. Borgatti and Cross hypothesize that knowing, access, and cost would act as mediating variables for the effect of proximity. To examine this, they ran regression models and found that both knowing and access acted as mediators for both study groups. Cost failed to predict information seeking in both groups and could not be a mediating variable.
Table 1

Summary of results from Borgatti and Cross (2003)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Information seeking Group 1</th>
<th>Information seeking Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hierarchy</td>
<td>N/S</td>
<td>N/S</td>
</tr>
<tr>
<td>Tenure</td>
<td>N/S</td>
<td>N/S</td>
</tr>
<tr>
<td>Gender</td>
<td>N/S</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>Proximity</td>
<td>p &lt; .01</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>Knowing</td>
<td>p &lt; .01</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>Accessibility</td>
<td>p &lt; .01</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>Cost</td>
<td>N/S</td>
<td>N/S</td>
</tr>
<tr>
<td>Valuing</td>
<td>p &lt; .01</td>
<td>p &lt; .01</td>
</tr>
</tbody>
</table>

Social identity and Relational Information seeking

Since the benefits from shared social identity effects evaluations of people, they can affect the antecedents of informal information seeking. Several of the results of the social identity studies are directly relevant to Borgatti and Cross’s variables of accessibility, valuing, and knowing.

Dovidio, et al.’s (1997) research found that sharing personal information and helping behavior were both increased in single-group conditions when compared to two-group
conditions. Sharing of personal information can be seen as increasing the knowing variable. This link is not likely to be precise, as personal information may or may not correlate with knowledge that is relevant in a work context.

Accessibility is more about the evaluation of the individual and relationship than knowing. The estimation of accessibility is based upon how likely a person is to take time for the requestor. This, in essence, is an estimation of how much someone will help. Rabbie and Horowitz’s (1969) study suggests that assessments of accessibility would be improved by ingroup biases. Ingroup bias increased assessment of openness and responsibility, both of which can contribute to an assessment of accessibility.

Borgatti and Cross (2003) define valuing as the amount that an information seeker positively evaluates the knowledge and skills of a potential informer. While many factors will certainly go into the evaluation of knowledge and skills, ingroup biases can influence that evaluation. Mackie, et al.’s (1990) research shows that ingroup arguments are more persuasive. By extension, ingroup members can be seen as having better grasp of topics than outgroup members. This preference for ingroup information will shape the evaluation of knowledge when deciding where to look for information and learning informally in the organization.

**Information seeking as Informal Learning**

Informal learning encompasses a large number of practices, including self-directed learning, social learning, mentoring, coaching, learning through asking for help, learning from mistakes, and learning through trial and error (Cseh et al., 2000). Informal learning
research comes from many different practical and theoretical backgrounds, creating a diverse literature. Research foci include topics on the improvement of informal learning in an organization (Cross, 2006) the power dynamics of informal learning (Garrick 1998), the individual’s traits in the experience of informal learning (Tough, 2002), and the social context formulating the learning for individuals (Wenger, 1999). This diversity serves to create a wide range of definitions for informal learning, which in turn makes showing that information seeking is informal learning a small challenge. In order to achieve this, I will discuss informal learning as an interpersonal activity that is ubiquitous and relational, often as simple as a quick exchange of information. First, I will examine the informal learning literature focusing on the relational aspects of informal learning. Then I will look at the ubiquitous nature of informal learning and how Borgatti and Cross’s conceptualization of information seeking fits into concept of informal learning.

**Informal learning as relational.** Tannenbaum (1997) studied the factors that go into continuous learning within organizations. His research has two foci. The first is the organizational context and the second how people learn within organizations. Tannenbaum surveyed seven organizations to understand the key features of their learning environments. Informed by previous literature, he examined the occurrence of 10 learning conditions and consequent outcomes.

Tannenbaum asserts that positive learning environment occurs when individuals are aware of the ‘big picture’; individuals are assigned to tasks where they can apply previous learning; mistakes are tolerated during on the job learning; individuals are accountable for learning; situational constraints to learning are identified and minimized; new ideas are
valued and encouraged; supervisors and coworkers provide support; and policies support effective use of training. These represent the independent variables his survey of seven organizations. The dependent variables that Tannenbaum measured were individuals’ perceived competence, satisfaction with development and a positive view of training within the organization.

One of the main points that Tannenbaum set out to examine was the difference in learning environment based on the difference in organizations. The seven organizations he examined were very different in nature: a military reserve unit, an insurance company, a bank branch, a manufacturer, a brokerage division an HMO and a government contractor. He did discover that all but one of his, situational constraints, varied by organization.

Another question driving this research was the relationship between the learning conditions and the outcomes of perceived competence, personal satisfaction and positive view of training. Tannenbaum performed a hierarchical regression analysis, controlling for education level, tenure, years of work experience, and age. He found that the people who reported having a greater awareness of the big picture also felt a higher level of competence. Satisfaction in development was related to the following independent variables: providing greater opportunities to learn; supportive training policies and practices; and open to new ideas and change. Positive view of training within the organization was related to: supportive training policies, openness to new ideas, high performance expectation, and strong managerial support contributed positively to employee perception of training.

Tannenbaum’s research focuses on the sources of learning. He developed a list of 12 learning sources based on interviews with representatives from the organizations. He then
asked individuals to distribute 100 points between the 12 categories to describe how much each contributed to their learning. These sources are shown in Table 2, along with the overall mean percentage that was reported by participants. Tannenbaum notes that formal training is only responsible for 20% (formal training + classroom learning) while the other 80% of learning occurs outside of the classroom.
Table 2

*Sources of Individual Learning in the organization (Tannenbaum 1997)*

<table>
<thead>
<tr>
<th>Source</th>
<th>Overall Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor at current organization</td>
<td>8.6%</td>
</tr>
<tr>
<td>Supervisor at previous employers</td>
<td>5.0%</td>
</tr>
<tr>
<td>Co-workers &amp; peers at current organization</td>
<td>11.3%</td>
</tr>
<tr>
<td>Co-workers &amp; peers at previous employer</td>
<td>7%</td>
</tr>
<tr>
<td>Former educational experiences</td>
<td>13.7%</td>
</tr>
<tr>
<td>Former on-the-job training</td>
<td>11.4%</td>
</tr>
<tr>
<td>Trial and Error</td>
<td>9.9%</td>
</tr>
<tr>
<td>Observing Others</td>
<td>8.3%</td>
</tr>
<tr>
<td>Reading/Self-Study</td>
<td>10.3%</td>
</tr>
<tr>
<td>Professional colleagues at other companies</td>
<td>3.8%</td>
</tr>
<tr>
<td>Family and Friends</td>
<td>5.6%</td>
</tr>
</tbody>
</table>

Of interest in this dissertation is the amount of learning attributed directly to people. Supervisors past and present, colleagues past, present and at other organizations, and family and friends account for nearly 40% of the learning sources.

Tannenbaum did a similar analysis of the sources of learning as he did to the
environment. He found that eight of the 12 sources were significantly different between organizations. This difference could be large at times; for example, “current peers” varies from 5% to 18% between organizations. The sources without significant differences were reading/self-study, family and friends, supervisors from previous employers and formal training. He attributed the lack of difference in the first three as an issue of those being individually controlled rather than organizationally controlled sources. Training’s lack of variety was left unexplained, except to say “It appears that formal training accounts for a small but consistent amount of development.” (p. 445)

Tannenbaum found that individuals that attributed a greater percentage of learning to current supervisors reported higher levels on all three outcomes he measured: self-competence, satisfaction with development and a positive view of training. Individuals who reported greater reliance on professional colleagues outside the organization reported lower self-competence and less satisfaction with development. Finally, a more positive view of training in the organization followed from a greater share of learning attributed to previous education, formal training and on-the-job training.

In the process of developing a new model for enhancing informal learning, Marsick and Watkins (2001) present a review of literature on the phenomenon. They examine multiple qualitative studies and conclude that the contextual factors create opportunities for informal learning. Context shapes the definition that they propose, on that varies only slightly from their original collaboration in 1990: “not typically classroom-based or highly structured, and [where] control of the learning rests primarily in the hands of the learner.” (p. 12) Marsick and Watkins also distinguish informal learning from incidental learning, which is a
byproduct of something such as task accomplishment, social interaction or just navigating an organizational culture. These definitions are congruent with the idea of informal being interpersonal and ubiquitous; informal being a combination of “not-classroom” and learner-lead, and incidental being simply learner-lead but not deliberate.

Marsick and Watkins go on to highlight research done by graduate students in order to update their model for how informal learning occurs. They discuss research by two of their students who examined informal learning in small private companies in Romania and a publicly funded incubator in the United States. In Romania, the researchers found that learning was stimulated by the post-Soviet context (Cseh, 1999) and in the United States, the researchers found that incidental learning occurred from being co-located with other companies dealing with similar issues (Callahan, 1999). They finally note research that suggests that unplanned events are often the trigger of informal learning (Carter, 1995).

Marsick and Watkins (2001) research focuses on what causes informal learning, more than its nature. Their analysis of the nature of informal learning includes a mistake that is built into the perspectives of many others: assuming the classroom is the central aspect of learning and that learning outside of the classroom requires a special event to inspire it. However, their understanding of the learning that occurs within the pursuit of other goals reveals a connection to the ubiquitous nature of informal learning.

One of the earliest studies on self-directed learning shows how learning is ubiquitous. Tough embarked on a study of self-directed informal learning in 1967, and discovered that the typical adult was involved in eight different learning projects throughout the previous year. Tough defined a learning project as a series of episodes of a minimum length and at
least half motivated by a desire to gain a skill or make some other change in him or herself.

Tough used an extensive interview process for his research, and besides discovering the frequency of self-directed learning, Tough also discovered a common process among self-directed learners. Tough interviewed 66 people from various socio-economic backgrounds: blue collar workers; men and women in low-paying white collar jobs; elementary school teachers; municipal politicians; university faculty; upper-class women with pre-school children. From his interviews, he articulated a thirteen step process for self-planned learning projects.

1. Deciding what detailed knowledge and skill to learn;
2. Deciding the specific activities, methods, resources or equipment for learning;
3. Deciding where to learn;
4. Setting specific deadlines or intermediate targets;
5. Deciding when to begin a learning episode;
6. Deciding the pace at which to proceed during a learning episode;
7. Estimating the current level of his knowledge and skill or his progress in gaining the desired knowledge and skill;
8. Detecting any factor that has been hindering learning or discovering inefficient aspects of the current procedures;
9. Obtaining the desired resources or equipment or reaching the desired place or resource;
10. Preparing or adapting a room for learning or arranging certain other physical conditions in preparation for learning;
11. Saving or obtaining the money necessary for the use of certain human or nonhuman
resources;
12. Finding time for the learning; and
13. Taking steps to increase the motivation for certain learning episodes. (Tough, 1967)

Tough’s 13 steps can be seen as planning process for self-teaching, rather than an informal learning process that happens organically. Tough notes that this learning tends to occur outside of formal institutions, however. Over several decades of study, he found that the majority of the learning observed did not involve hiring an instructor or engaging a learning institution (Tough, 1999). The 13 steps persist as the core of Tough’s idea of self-directed learning, but he has come to see how context frequently contributes to an ad hoc way of execution.

Although Tough’s work is infrequently cited in the informal learning literature, and in fact occasionally critiqued for being linear and mechanistic (Merriam & Caffarella, 1999), he originates two ideas that frame much of the current discourse on informal learning. Through his interviews, Tough found that self-directed learning, both informal and formally assisted, is a very social activity. With some irony, he states “there may actually be more social interaction in informal learning than there is in classroom learning, which again shatters one of our stereotypes” (1999, p. 5). The social nature of informal learning trends through current research that focuses on context and organizational setting of informal learning. Tough’s research also provides evidence for the idea of the invisible nature of informal learning. Tough notes that “people just don’t seem to be aware of their own learning.” (1999, p.2) He discovered that people are spending up to 15 hours a week on informal, self-
directed learning and not even acknowledging it as learning. Tough goes on to say “informal learning just seems to be a very normal, very natural human activity, and that’s why I think… [it] is so invisible” (p.2)

Informal learning as ubiquitous. Informal learning has no set location. Many theorists define it by its lack of classroom, but a positive way to express this is that informal learning is everywhere. Eraut’s (2004) research reveals many ways informal learning is ubiquitous. His qualitative research in a hospital ward develops a typology of informal learning. Because of an expected bias towards atypical events, he avoided the critical incident format (Flannagan, 1954) and looked to discuss the typical and mundane aspects of work. Through these interviews, he draws a picture of the learning process on the job for hospital workers. He found that the respondents tended to not focus on learning experiences in their descriptions of day-to-day activities. From the evidence, Eraut concludes that informal learning is invisible, with the resulting knowledge generally being tacit. Moreover, the “discourse about learning is dominated by codified, propositional knowledge, so respondents often find it difficult to describe more complex aspects of their work” (Eraut, p. 249).

Despite the fact that most respondents still equated learning with formal education, Eraut found enough data to formulate a typology of informal learning. This typology places informal learning on a continuum with formal learning rather than as a dichotomy with it. His typology is based on three levels of intention and three time frames. The levels of intention are implicit, reactive, and deliberative and the time foci are past, present and future. The implicit level of intention creates learning that is not consciously linked to an attempt to
learn and consequently the learner may not be directly aware of the new knowledge. An example of this is the knowledge gained about computer file systems due to regular interaction with a PC. The reactive level has a higher level of intention, but still unplanned. Eraut (2004) describes reactive learning as “intentional,… [but] in the middle of the action, with little time to think.”(p. 250). Finally, deliberative learning includes both deliberate learning (Tough, 1971) with explicit curricula and deliberative activities in work such as strategy planning and problem solving. Eraut’s typology relies on an increase in intention, but it is interesting to note that even the most intentional of his learning types is not constrained to the classroom. Deliberative learning certainly encompasses classroom learning, but distinctly includes deliberative actions outside of traditional educational contexts.
Table 3

*Typology of informal learning*

<table>
<thead>
<tr>
<th>Time of Focus</th>
<th>Implicit Learning</th>
<th>Reactive Learning</th>
<th>Deliberative Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past Episodes</td>
<td>Implicit Linkage of past memories with current experience</td>
<td>Brief near-spontaneous reflection on past episodes, events, incidents, experiences</td>
<td><em>Discussion and review</em> of past actions, communications, events, experiences</td>
</tr>
<tr>
<td>Current Experience</td>
<td>A selection from experience enters episodic memory</td>
<td><em>Noting</em> facts, ideas, opinions, impressions; <em>asking</em> questions; <em>observing</em> effects of actions</td>
<td><em>Engagement</em> in decision making, problem solving, planned informal learning</td>
</tr>
<tr>
<td>Future Behavior</td>
<td>Unconscious expectations</td>
<td><em>Recognition of</em> possible future learning opportunities</td>
<td><em>Planning</em> learning opportunities; <em>rehearsing</em> for future events</td>
</tr>
</tbody>
</table>

Eraut, 2004, p. 250
Eraut found that participants learned during work primarily from four key events. None of these events were in training and, in fact, none of the events were explicitly designed to produce learning. In Marsick and Watkin’s (1990) terms, they would all be incidental learning moments. These four events are participation in group activities, working alongside others, tackling challenging tasks, and working with clients. These four events each challenged the participants to articulate meaning in a way that others can understand, and typically do it in a context that involved complexity through challenge or interpersonal relationships.

In 2004, Skule researched informal learning from a new angle. Where other researchers had focused on the individual or the organization, Skule researched the learning intensity of specific jobs. He interviewed Norwegian business people from 11 different organizations and different sectors to develop a survey that measures the learning intensity of work. His survey was based upon a combination of subjective judgments of how learning intensive a job is, the educational requirements that the job requires, and the durability of the acquired skills. This construct became the dependent variable and was analyzed against three independent variables: personal characteristics, company and external environments, and characteristics of the job. They found that seven factors are distinctive in the jobs that are reported as the most learning intensive. These factors were high degree of exposure to changes, high degree of exposure to demands, managerial responsibilities, extensive professional contacts, superior feedback, management support for learning and the rewarding of proficiency. Exposure to change is specifically about changes in technology and methods. Exposure to demands involves the number of people that directly request the job for
production – clients, colleagues, managers. Managerial responsibilities are those tasks that involve directing the work of others and coordinating people to achieve goals. Extensive professional contacts are due to opportunities to participate in trade groups and networking across the industry. Superior feedback is more accurately the ability to see consequences of work, rather than personal feedback. Management support for learning allows for time and resources to step away from work in order to learn specific skills. Finally, rewarding proficiency is an organizational context that encourages development through some sort of merit pay.

Generally speaking, a learning-intensive organizational context requires employees to react to demands from both internal and external sources. Skule posits that this is due to a post-Taylorist philosophy in organizations that enables people to interact with a wider variety of people. Further, a learning-intensive job should offer opportunities to access learning resources needed to cope with these demands. These resources may include, according to Skule (2004), “advice and guidance from colleagues and external vocational networks, direct contact with customers and suppliers, access to databases, literature and other relevant sources of learning, plus the time to utilize [sic] such learning resources.” (p. 14-15)

Support for a ubiquitous and relational nature of informal learning is evident from the examination of Knowles’s (1950) Tough’s (2002) Marsick and Watkin’s (1999), Erault’s (2004) and Skule’s (2004) models. While each model does not support both criteria, all of them support one or the other.

Marsick and Watkin’s incidental learning is an example of learning that blends into other experience. Erault’s model describes this with even more precision, noting the
possibility of learning through linking past memories, problem solving and other activities that occur throughout any given work day. The method of Skule’s work is to examine the key features of the jobs, not the individuals. In order for his work to be relevant, these features must be ubiquitous. Especially significant is the commonality of demands and change in Skule’s model.

The social nature of learning is asserted by Tough as well. He notes “Informal learning is a very social phenomenon” (Tough, 1999, p. 4) and adds that “there may actually be more social interaction in informal learning than there is in classroom learning” (Tough, 1999, p. 5). Tough makes the assertion because of the impersonal infrastructure in formal education – books, Websites, presentations – and the fact that individuals regularly start their informal learning process by asking people they think may know the answer. Eraut’s four key learning events (2004) are all decidedly social: participation in group activities, working alongside others, and working with clients, with the notable exception of tackling challenging tasks. Skule finds that being able to participate in professional groups is a sign of a high-learning job.

Research in informal learning supports the idea that informal learning is ubiquitous to the point of being inspired by the mundane aspects of work. Research also supports the social nature of informal learning, pointing to the role interaction with colleagues plays in informal learning. With this in mind, I consider informal learning the behaviors that people engage in to increase their knowledge or skills or develop new attitudes. This includes things as well-defined as self-education and things as simple as water-cooler conversation. In operationalizing, I will use information seeking behaviors in order to leverage the research of
Borgatti and Cross (2003) look directly at information seeking in the process of work. The question they ask in their quantitative study is “Please indicate how often you have turned to this person for information or knowledge in the last 3 months” (p. 437) rather than asking about learning. The task of information seeking fits into the models of informal learning from Marsick and Watkins and Tough. Asking questions of others is even directly included in Eraut’s (2004) examples of reactive learning.
Chapter 3

Methods

Research Design

The design for this study is a social network analysis (SNA). SNA examines relational ties between actors within a network and the actors’ understandings of those relationships (Wasserman & Faust, 1994). The network aspect of SNA suggests that actors have ties to some individuals, and each of those individuals are tied to another set of individuals, with the potential of some, no, or complete overlap in connections. For example, Alex says he is friends with Bob and Candice. Bob says he is friends with Alex and Dee. Candice says she is friends with Dee. Finally, Dee says she is friends with Alex and Candice. This would represent a network with variable relations. Friendship is presented as the framing question for the relationship in this case, but SNA can be used to examine relationships defined by many different characteristics. Examples include social support (Gottlieb, 1981), exchange and power (Cook and Emerson, 1978), and social perception (Krackhardt, 1987). Because of this relational aspect, Hatala (2006) suggests that social network analysis (SNA) is an appropriate method to increase the rigor for examining questions such as informal learning in the workplace.

As a distinct methodology, social network analysis has some particular vocabulary. The individuals within a social network analysis are called actors. When portrayed within a social network graph, they can also be called nodes. Finally, the relationship between two actors is generically called a link.
Sample

The sample for this study is a small professional services firm based outside of Boston. At the beginning of research, the firm has 150 employees. The organization was chosen through a convenience sample, as the researcher knows the chief executives of the organization. The Chief Operating Officer provided key information for the study and consulted on customizing questions to reflect the company's specific context. This study will survey approximately 60 employees hired in the past two years. Each employee will have been through a training program with a cohort including, on average, 10 other employees. All participants will have been in one of the training programs. A total of 6 cohorts have gone through this program ranging from 16 months before the survey to two weeks before the survey.

Training course description

The training course is a one-day course that occurs in the Massachusetts office once a quarter. The day runs from 8:30 am to 7:00 pm and includes three meals together. The training involves lectures on the corporate culture and history from the executive team as well as two experiential sessions: one that focuses on improvisation and another that involves creating a cultural artifact for the training. The desired outcomes for the training are:

- Reinforce the <company> brand, make connections unrelated to divisional lines,
- reinforce team concepts, better educate members on firm (especially outside their divisions),
- make sure execs know all new hires and vice versa, build touchstones for people that extend beyond divisions, set/reinforce performance expectations, reinforce culture (organizational memo, 2011)
The day concludes with a social hour that gives the participants an opportunity to mingle with the executives, each other and employees from the Massachusetts office. A copy of the schedule was made available to the researcher under the request that it not be reprinted.

This sample potentially poses an issue of boundary selection. Laumann, Marsden & Prensky (1992) discuss the challenges that boundary selection causes for social network analyses, noting that boundary selection is an inherent part of network analysis. A researcher needs to choose who is in a study and who is not, or else any study of relationships will grow too large to be functional. A classic example is Roethlisberger and Dickson who studied a bank-wiring room in 1939. Their study deliberately limited the sample to the men who shared the workspace on a switchboard. Laumann, et al. call this the realist approach. The realist approach is based on the assumed self-definition of the actors. The men in the bank-wiring room saw themselves as a group. This method for selecting boundaries is common when considering organizations, events and other well-structured groupings.

The other method that Laumann, et al. consider is the nominalist perspective. This perspective is based on the researcher’s own theories about a group and may or may not have any correlation with a self-defined group. The nominalist perspective is sometimes used to uncover ‘hidden networks’ that actors are a part of but unaware of.

Besides strategies of defining the network, Luamann, et al. explain how foci for inclusion change the dynamics of a network analysis. They point out three main foci: personal attributes, relational attributes and participation in an event. This research uses a nominal approach, with the foci of inclusion being participation in the new-hire training
program. Luamann et al. argue that this method for bounding a network is as valid as the realist approach, noting “there is no sense in which social networks must naturally correspond to social systems” (p.78).

**Data Collection**

Participants were sent an email with a link to a web-based survey. The survey is based on Borgatti and Cross’s (2003) analysis of the relational factors in social learning and demographic data. In addition to the survey, the Chief Operating Officer provided archival data consisting of training program rosters and employee starting dates. The survey was open for 2 weeks. A reminder email was sent 5 days and 10 days after the first email. The recruitment and reminder emails are found in Appendices B, C, and D.

**Instrumentation**

This study is an expansion of Borgatti and Cross’s (2003) work and consequently the variables in the survey are directly borrowed from their work. Borgotti and Cross asked demographic questions, information seeking question and three assessments about the relationship with the individuals in question.

*Information seeking* is the primary dependent variable in this study. Information seeking is the act of deliberately finding an actor with an informational question. In order to insure that this variable is as accurate as possible, a double-response method developed by Borgatti et al. (1999) is used. The method entails asking actor h how often he seeks information from actor j, *(GetInfo)* but also how often actor j seeks information from him*(GiveInfo)*. The average of h’s response for GetInfo j, and j’s response to GiveInfo h constructs the dependent variable. This method reduces the impact of respondents forgetting
interaction or biases towards long-run frequencies (Freeman et al. 1987). The questions for this variable are:

Please indicate how often you have turned to this person for information or knowledge on work-related topics.

Please indicate how often this person has turned to you for information or knowledge on work-related topics.

The scale for these two questions is:

1 Never
2 Less Than once a month
3 Once month
4 2-3 times a month
5 Once a week
6 2-3 times a week
7 Daily

Borgatti and Cross examined three variables and their influence on information seeking behavior. The variables were developed based on qualitative study done by Cross and Borgatti (2000). The three variables that they developed are knowing an actor’s expertise, valuing an actor’s expertise and belief that an actor is accessible in a timely fashion.

Knowing is the amount that an actor is aware of another individual’s expertise.
Knowing is currently a common variable in the transactive memory research (Weick and Roberts 1993; Moreland et al., 1996; Hollingshead, 1998; Rulke and Galaskiewicz, 2000). Knowing who knows what information is considered a key concern in the performance of transactive memory systems. The knowing variable explains that in order for the knowledge $h$ possesses to be useful to $j$, $j$ needs to be aware of its existence. The question for knowing is:

I understand this person’s knowledge and skills. This does not necessarily mean that I have these skills or am knowledgeable in these domains, but that I understand what skills this person has and domains they are knowledgeable in.

The scale for this question is:

1 Strongly disagree
2 Disagree
3 Neutral
4 Agree
5 Strongly agree

Valuing. In order to choose who to ask for information, an actor needs not only to know what information is potentially in the network, but also needs to have an estimate of the value of a given individual’s insight. Borgatti and Cross describe it this way:

If actor $i$ knows with a great deal of certainty that actor $j$ is a poor source of information regarding a certain topic, then the probability that $i$ will go to $j$ for information
on that topic is lowered. (2003, p. 434)

The scale for this question is:

1 Strongly disagree
2 Disagree
3 Neutral
4 Agree
5 Strongly agree

They note that this variable was not directly studied before their work, but cite O’Reilly (1982) and his research that found that in choosing among coworkers, people took into account source quality as part of their decision. This was contrary to his discovery about choice among impersonal sources, such as manuals and software, for which accessibility was the main predictor. The question for value is:

This person has expertise in areas that are important in the kind of work I do.

Accessibility is the likelihood that actor $h$ can bring actor $j$’s expertise into her work process in a suitable time frame. Borgatti and Cross explain the effect of accessibility through a lens of satisficing (March & Simon, 1958). Satisficing says that as desired goals become harder to achieve, we choose easier goals in order to conserve mental or physical effort. For example, if Alex knows that Candice has a great deal of expertise on a topic, but she is hard to talk to for some reason (distance, personality, time constraints) then he may go to Bob, who is not as knowledgeable but is more available. So, as answers are harder to find, standards of search fall (Cohen et al. 1972, Perrow 1986). The accessibility question is:
When I need information or advice, this person is generally accessible to me within a sufficient amount of time to help me solve my problem.

The scale for this question is:
1 Strongly disagree
2 Disagree
3 Neutral
4 Agree
5 Strongly agree

Besides the relational data, demographic data is taken from respondents in order to control for existing relationships and likely affiliations. Borgatti and Cross (2003) controlled for gender, tenure, hierarchy, and proximity in their study. These variables are included in the survey for this study. Gender is measured by forced choice between “male” and “female” on the demographic question.

Tenure information is acquired from the archival data. Each participant’s starting month was included in the data that listed training program participation. Tenure was coded as a number between 0 and 21 corresponding to the months from the date of the survey administration.

Hierarchy was ascertained by asking the participants to position themselves in one of 5 levels: Entry level, Supervisor, Manager, Director and Vice President. These categories
were developed with the assistance of the Chief Operating Officer with the company and as such are assumed to be meaningful to the participants.

Proximity was measured by asking participants “In which office do you primarily work?” The company has offices in Charlestown, Massachusetts; Reno, Nevada; Salt Lake City, Utah; London, UK; and Singapore. Participants were also given the option of selecting “telecommute” as an answer.

Co-participation in training courses and time from training will be ascertained using archival data from training programs. This data was anonymized using a set of random numbers so that specific training dates do not reveal relationships between participants. This was used because archival data provides more accurate, although sometimes more challenging to acquire, data for group membership (Marsden, 1990). The entire survey can be found in Appendix A.

Reliability. Knowledge, value and accessibility are each measured by using a single network question. This is typical in network research (e.g., Ibarra 1992, 1995) and has some criticisms based on psychology’s history of using factors to measure variables (Rogers & Kincaid, 1981). However, Marsden (1990) argues for the reliability of one-item indices when appropriate measures are used to aid respondent’s accuracy in reporting network data. Borgatti and Cross (2003) pre-tested their questions, made them highly specific and focused on typical long-term patterns (Rogers & Kincaid, 1981).

Beyond the pre-test of questions, further measures were taken to increase reliability. Likert scoring makes a question more reliable than categorical questions (Mouton, Bake and Frutcher, 1955), and the Borgatti and Cross question are based on a 5-point Likert scale.
Also, the measure for information seeking is an aggregate measure, which have been shown to be more reliable in test-retest evaluations (Burt, Masden & Rossi, 1985)

The archival data for training participation provides the independent variable of training group co-participation. This data shows attendance as listed by the training managers or other responsible individual. This data may have reliability issues, as the process for taking attendance in training programs is not standardized across organizations. In order to assure that recall is not an issue only data that is recorded at the date of the training program is used for the data.

Validity. With single question social network variables, a misunderstood survey item can be very detrimental. As Marsden (1990) suggests, the items for the four network questions in this study are specific enough to protect against confusion. The questions are also written to focus on a time frame, rather than a specific point in time which also increases validity (Rogers & Kincaid, 1981). Face validity is high for these questions. Unfortunately, Wasserman and Faust (1994) note that very few studies have been done to check construct validity for network data. Borgatti and Cross’s (2003) instrument is similarly not analyzed for criterion or construct validity.

Analysis

Social network analysis distinguishes itself from standard statistical analysis in some interesting, and troubling. SNA assumes that actors are interdependent, which violates a fundamental assumption of standard statistics. Because of this, particular statistical methods are needed. Modifications of the standard statistical analyses involve forced permutations to enable an assumption of normal distribution and independence.
Network studies use the dyad and their relationship as the unit of analysis, and as such the data cannot be assumed to be independent, Krackhardt (1988) proposes that the quadratic assignment procedure (QAP) is the appropriate way to measure correlation between variables. The QAP uses random permutations of the matrix of network data in order to create a non-relationship condition in the data (Baker and Hubert 1981). Multiple permutations create a dummy ‘population’ for which the actual data is considered a sample of. The null hypothesis in this test is that the results found in the study equals the expected value from the permutation distribution (Hubert, 1987). Dekker, Krackhardt and Snijders (2003) explain it as “test[ing] whether there is no similar pattern between the elements of the different variables” (p. 2). He compares the utility of QAP to ordinary least squares (OLS), a data analysis technique common in econometrics. OLS can handle auto-correlated data, but using a constructed data set and manipulating the autocorrelation, Krackhardt found that as the level of autocorrelation increases, the proportion of a Type 1 error increases from 0.1 to 0.6. Meanwhile, using the same data the proportion of Type 1 errors stayed at 0.1. In network data, the level of autocorrelation is high by definition. Networks are assumed to be interdependent. As such, the QAP is a better analysis tool for networked data.

The QAP can be extended from bivariate situations to multi-variate situations as well. These analyses are known as multiple regression – quadratic assignment procedure (MRQAP). Krackhardt (1988) explains how this is done by “statistically extract[ing] the information predicted by the other independent variables and then conduct a simple regression on the residuals” (p. 367). The new regression results in a β that is precisely equal the β in the multiple regression. This process essentially takes the multi-variate regression
and makes it into a QAP. Krackhardt goes on to show that the Type 1 errors in this process are once again very low. (cf. Krackhardt 1988, chart on page 369)

For this study, four MRQAP’s will be performed. The first will examine information seeking as the dependent variable, with the control variables, group co-participation, and knowledge, access and value as the independent variables. Following that, knowing, valuing and accessibility will each be examined using the MRQAP with group as the independent variable.

Before the MRQAP can be run, the demographic data must be transformed into matrix data. For the qualitative data, this will result in a binary set up where each variable is 1 or 0 depending on if a trait is shared or not. For example, the office variable is coded from the survey with a value of 1 through 6, with each number representing a different office. The matrix transformation compares each participant’s value to each other participant’s and records a 1 for a match and a 0 for non-matching. This is the way that office, gender, and department are matrixed.

Tenure, time from training and level are handled differently. For these variables, he valence is important as well as the difference. I want to understand if a 12 month difference in tenure has more of an effect that a 2 month difference. For these variables, the matrix transformation records a value by subtracting one actor’s value from the other actor in dyad. These variables will be reported as difference variables – tenure difference, level difference, and

For example, if Chuck has 20 months on the job and Denise has 3 months, the value of the variable tenure diff would be 17 for C-B and -17 for B-C.
Chapter 4

Results

Demographics

Twenty-eight training participants from the previous two years agreed to participate in the study. Of these 28, one survey response was a duplicate from the same respondent and one was incomplete. The remaining 26 participants are considered the network for the analysis of this study.

The demographics of the response group show a representative cross section of the newly hired employees. The group is 55% female, 45% male. The largest age group is 26-30, with 45% of the group in that range. Table 4 shows the breakdown of ages. These demographics are confirmed by the COO as representative of the organization overall.
Table 4

Age range

<table>
<thead>
<tr>
<th>Age</th>
<th>Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;21</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>21-25</td>
<td>3</td>
<td>10%</td>
</tr>
<tr>
<td>26-30</td>
<td>13</td>
<td>45%</td>
</tr>
<tr>
<td>31-35</td>
<td>5</td>
<td>17%</td>
</tr>
<tr>
<td>36-40</td>
<td>4</td>
<td>14%</td>
</tr>
<tr>
<td>41-45</td>
<td>3</td>
<td>10%</td>
</tr>
<tr>
<td>&gt;50</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Hierarchically, 39% of the respondents were entry-level employees, which represents all individual contributors, regardless of skill level. For example, this category includes web designers, administrative assistants, and sales associates. Managers and supervisors represent 46% of the group, and executives represent 14%. The vast majority of the respondents are from the Boston office, 62%, while 21% are from the London office. The remaining 16% are either telecommuters or in the west coast offices.

Tenure and training co-participation information were coded form the archival data provided by the Chief Operating Officer. Training rosters and an employee start-date roster provided the source for data for these two variables. The average tenure of the new hire groups is 12 months, with the minimum being zero months and the maximum being 21 months. The standard deviation is 4.72 months. All six training programs are represented
with the respondents, with an average of 4.3 (s=1.81) participants in each course.

**Quadratic Assignment Procedure**

In order to evaluate the hypothesis, I took a two-step process. First, a quadratic assignment procedure (QAP) describes any covariance with the independent and demographic variables. This step insures that the variables are measuring separate constructs, and if they don’t, allows me to reevaluate their inclusion or look to combining the offending variables. After the QAP, I perform a multilinear regression quadratic assignment procedure (MRQAP) to examine the influence the independent variables have the dependent variables.

The Quadratic Assignment Procedure (QAP) correlations shown on Table 5 show the relationships between the variables in the study. The QAP shows correlations between the different variables in the study without controlling for the other variables. It is an effective way to see what, if any, variables covary with one another. The demographic variables have almost no correlation amongst themselves, with two exceptions being office correlating with department ($\beta=0.233, p<0.001$) and level difference correlating with tenure difference ($\beta=-0.336, p<0.05$). Department and office are an intuitive correlation, as most companies house functions together and, in this particular company, the holding group is entirely based in the Massachusetts office. The correlation of level difference and tenure difference can be seen as a quirk of the hiring cycle. A negative correlation between tenure and level difference means that the tenure difference increases while the level difference decreases. Tenure difference increasing means an actor was hired less recently than the actor they are being compared to. Level difference decreasing means that the actor is of a higher level than the
actor they are being compared to. This suggests that people hired more recently are of a higher level than the people hired at the beginning of the observation period. While I am not privy to the hiring records, this implies that the organization hired more junior people when the on-boarding program started and senior staff more recently.

The demographic variables show some correlation with information seeking which suggests further examination in the multiple regression (MRQAP) that follows this analysis. Gender (-.099) and level difference (0.198) all correlate with information seeking at a p<0.05. Office (0.260) correlates with information at a p<0.001 level. All three of these variables correlate with information seeking and warrant further scrutiny in the MRQAP.

The independent variables - knowledge, value and group - each correlate with one another. Group also correlates with access (0.081, p<0.05), knowledge (0.11, p<0.05) and value (0.132, p<0.01). Within the demographic variables, office correlates with access (0.229, p<0.001), knowledge (0.612, p<0.001) and value (0.573, p<0.001). Department correlates with knowledge (0.176, p<0.01) and value (0.244, p<0.001). Finally, level difference correlates with value (0.115, p<0.01). All of these correlations need to be kept in mind when examining the MRQAP results, as the correlation of the independent variables can affect the results of the analysis.

In fact, two potential problems of multicollinearity are clear upon examining the correlations: knowledge and value correlate with one another at 0.899, and tenure and time from training correlate at 0.910. Multicollinearity is a condition where two variables are highly correlated, making it hard to evaluate them independently within a multiple regression. Each of these situations need to be examined in order move forward in analysis.
To explore the multicollinearity, I ran an MRQAP omitting the knowledge variable and found that value did have a significant effect ($\beta=0.189$, $p<0.001$). Similarly, omitting the value variable from the analysis resulted in knowledge increasing its effect slightly ($\beta=0.210$, from $\beta=0.166$). A combined knowledge and value variable has a similar result ($\beta=0.211$, $p<0.001$). These analyses can be found in Appendices E,F, and G, respectively. I chose to not combine the variables in the ultimate analysis since the purpose of my study was not to verify Borgatti and Cross’s 2003 results, so the relationship between those variables is not of significant importance in this study. Furthermore, I am using both variables as dependent variables for hypotheses in my study. I found very little change in the group variable’s $\beta$ when running the extra analyses. For the no-knowledge analysis, $\beta=0.75$ and $\beta=0.76$ in the no value condition. Both results were significant, $p<0.05$. This led me to leave the variables as they were in order to analyze the effect that group co-participation had on those variables.

Tenure and time from training are a different situation than knowledge and value. These variables covary at a 0.910 level and that makes intuitive sense given the fact that the training program in this study is a new employee program. With that in mind, in order to keep the analysis simple, I dropped time from training as a variable. However, I would suggest that future researchers include this variable as it could have a significant effect on the results.
Table 5

Correlation of Controls, Group, Borgatti and Cross variables and Information Seeking

*=p<0.05, **=p<0.01, ***=p<0.001

<table>
<thead>
<tr>
<th></th>
<th>Info Seek</th>
<th>Access</th>
<th>Knowledge</th>
<th>Value</th>
<th>Group</th>
<th>Age</th>
<th>Gender</th>
<th>Level Difference</th>
<th>Office</th>
<th>Tenure Difference</th>
<th>Time From Training</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Info Seek</td>
<td>1.00***</td>
<td>0.485***</td>
<td>0.342***</td>
<td>0.351***</td>
<td>0.136**</td>
<td>-0.032</td>
<td>-0.099***</td>
<td>0.196***</td>
<td>-0.094</td>
<td>-0.075</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Access</td>
<td>0.485***</td>
<td>1.00***</td>
<td>0.259***</td>
<td>0.299***</td>
<td>0.061*</td>
<td>-0.013</td>
<td>-0.024</td>
<td>0.122</td>
<td>0.229***</td>
<td>-0.156</td>
<td>-0.162*</td>
<td>0.055</td>
</tr>
<tr>
<td>Knowledge</td>
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<td>0.259***</td>
<td>1.00</td>
<td>0.859***</td>
<td>0.11*</td>
<td>-0.054</td>
<td>0.00</td>
<td>0.018</td>
<td>0.612***</td>
<td>-0.005</td>
<td>-0.013</td>
<td>0.176***</td>
</tr>
<tr>
<td>Value</td>
<td>0.351***</td>
<td>0.299***</td>
<td>0.899***</td>
<td>1.00</td>
<td>0.132**</td>
<td>-0.025</td>
<td>-0.021</td>
<td>0.115**</td>
<td>0.573***</td>
<td>0.069</td>
<td>0.014</td>
<td>0.240</td>
</tr>
<tr>
<td>Group</td>
<td>0.131**</td>
<td>0.061*</td>
<td>0.11*</td>
<td>0.132**</td>
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<td>0.006</td>
</tr>
<tr>
<td>Gender</td>
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<td>-0.018*</td>
<td>-0.00</td>
<td>-0.021</td>
<td>-0.027</td>
<td>0.025</td>
<td>1.00</td>
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<tr>
<td>Level Difference</td>
<td>0.198**</td>
<td>0.122</td>
<td>0.018</td>
<td>-0.115**</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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<td>0.00</td>
<td>0.396*</td>
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<td>Office</td>
<td>0.260***</td>
<td>0.229***</td>
<td>0.612</td>
<td>0.573***</td>
<td>0.025</td>
<td>-0.085</td>
<td>-0.008</td>
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<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
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<td>Tenure Difference</td>
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<td>-0.154</td>
<td>-0.005</td>
<td>0.039</td>
<td>0.00</td>
<td>0.00</td>
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<td>0.00</td>
<td>1.00</td>
<td>0.014***</td>
<td>0.00</td>
</tr>
<tr>
<td>Time From Training</td>
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<td>-0.162*</td>
<td>-0.013</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
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<td>0.00</td>
<td>0.91***</td>
<td>1.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Department</td>
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<td>0.035</td>
<td>0.176</td>
<td>0.264***</td>
<td>0.083</td>
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<td>0.02</td>
<td>0.00</td>
<td>0.223**</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Multiple Regression QAP

While the QAP can tell us what variables are related, the multiple regression quadratic assignment procedure allows us to evaluate the hypotheses. Group co-participation shows a small, but significant, effect on information seeking (β = 0.076, p<0.05) as well as access (β = 0.076, p<0.05), knowledge (β = 0.094, p<0.01) and value (β = 0.119, p<0.01). Meanwhile, the Borgatti and Cross 2003 research is partially supported, with access and knowledge both showing an effect on information seeking. Value does not, but this discrepancy with past research can be attributed to the previously noted high correlation between value and knowledge. While this correlation has no effect on the results of this
study, it does limit this study as a replication of Borgatti and Cross 2003. It also effects practical explanations and implications discussed later.

Two demographic variables show an effect on information seeking as well. Level difference ($\beta = 0.167$, $p< 0.01$) shows that, as level differences increase, the likelihood of information seeking increases. In other words, a positive value in level difference results from an employee in a lower level in the hierarchy seeking information from someone higher in the hierarchy.

Gender is the other demographic variable with a significant result in the MRQAP. Although significant, this result is very small ($\beta=-0.09, p<.01$). This negative effect was found in one of Borgatti and Cross’s (2003) groups as well. This means that people are slightly more likely to seek information from someone not of their own gender.

These results show support for each of the hypotheses about group co-participation’s effect, although it is weak in each case. Group co-participation accounts for 7.5% of the variance in information seeking, supporting my first hypothesis: *The extent to which actor $i$ seeks information from actor $j$ is a positive function of actor $i$ and actor $j$ participating in a training program together.* The $\beta$ for group co-participation shows an effect on value at 12%, supporting my second hypothesis, *the extent to which actor $I$ values the expertise of actor $j$ is a positive function of actor $I$ and actor $j$ participating in a training program together.* Group had a 7.6% effect on the access variable, supporting my third hypothesis: *the extent to which actor $i$ perceives he or she has access to actor $j$ is a positive function of actor $I$ and actor $j$ participating in a training program together* and had a 9.5% effect on the knowledge variable, supporting my fourth hypothesis: *the extent to which actor $i$ knows the expertise of actor $j$ is a positive function of*
actor I and actor j participating in a training program together. While the relative influence on variability is low, each of these results is significant. Group co-participation is a real factor in seeking information at work, as well as a real factor in the antecedents of information seeking that Borgatti and Cross (2003) found.
Table 6

*Beta Coefficient results of MRQAP analyses*

<table>
<thead>
<tr>
<th></th>
<th>Info Seek</th>
<th>Access</th>
<th>Knowledge</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All Demographics</td>
<td>Borgatti and Cross</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access</td>
<td>0.392***</td>
<td>0.427***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>0.166*</td>
<td>0.251**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value</td>
<td>0.053</td>
<td>-0.022</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>0.076*</td>
<td>0.128**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.008</td>
<td>-0.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-0.09**</td>
<td>-0.010**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level Difference</td>
<td>0.167**</td>
<td>0.188**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office</td>
<td>0.039</td>
<td>0.259***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tenure Difference</td>
<td>0.021</td>
<td>-0.031</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department</td>
<td>-0.019</td>
<td>-0.016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R Square</td>
<td>0.314</td>
<td>0.085</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*=p<0.05, **=p<0.01, ***=p<0.001*
Chapter 5
Discussion

The purpose of this study was to examine the effect the co-participation in training has on subsequent situations involving informal learning. Borgotti and Cross (2003) found that people are more likely to seek information from co-workers they feel are knowledgeable, whose knowledge they value, and importantly, who are accessible in the first place. This study hypothesized that information seeking and the three influencing variables (knowing, valuing and accessibility) would be influenced by co-participation in formal training experiences. That is, if participants took a training course together, they would be more likely to develop information-seeking relationships beyond the course than participants who did not take a course together. For this study, informal learning was operationalized as information seeking behavior, which is in line with the strongly social definition from Tannenbaum, (1997) who found 40% of informal learning was directly attributed to other people, and the ad hoc definition of Marsick and Watkins, (2001), who addressed incidental learning as a distinct type of informal learning.

The hypotheses each predict that a variable from Borgatti and Cross’s study is affected by training co-participation. The study found support for all of the hypotheses. Training co-participation has a small effect on information seeking ($\beta=0.076$). Along with co-participation, the accessibility variable ($\beta=0.392$) and the knowledge variable ($\beta=0.166$) had effects on information seeking. This partially reinforces Borgatti and Cross’s findings, although there is the curious fact that value was not found to have any statistical significance.
in the model.

One possible reason for value having no effect is the high correlation between value and knowledge (0.899). As mentioned in the results section, both knowledge and value are significant when the other variable is omitted from the analysis. Furthermore, a combined knowledge and value variable had a similar beta to knowledge all by itself. This leads one to conclude that in this particular organization, when one knows the expertise of someone else, one values that expertise.

The dynamic by which knowing and valuing co-vary could be caused by a relationship where the more one knows about someone’s expertise, the more one values it. It could also be caused by a dynamic where the more one values the expertise of another, the more one does research on that other party to discover more about their expertise. This study does not have the data to ascertain which dynamic is in play or, indeed, if there are not other dynamics that are at work here. The nature of the relationship between knowing and valuing is an opportunity for the research that will follow this study.

Besides the variables of interest, two demographic variables had significant effects on information seeking. Gender ($\beta = -0.09$, $p<0.01$) had an effect, which is a repeat of the findings of one of the groups in Borgatti and Cross (2003). The negative beta in gender means that people are likely to go to the other gender for information. This phenomenon is difficult to explain as a clear organizational issue. It could possibly be an anomaly in the data. Gender does not correlate with any other variable, demographic or a quality of the relationships in this study. One possibility that could account for this is a systematic qualitative gender difference in jobs. That is, a difference in jobs that women and men have
within the organization. This difference was not captured by the organizational level variable (gender and level difference covaried at β= 0.000). It is possible that the organization systematically put people women and men in different roles that result in seeking information from one another. However, Gender does not contribute variance to any of the antecedent variables; knowledge, value or accessibility. This seems to suggest that the information seeking across gender boundaries is not focused on information that is specifically work-related. A second possibility, outside the scope of collected data, could be that information seeking for work-related topics serves as an excuse for cross-gender social interaction. In other words, participants might have been using work questions as entrees into social conversations. While this is an extant area of research (eg. Berdahl and Aquino, 2009), it is currently outside the scope of this study.

Level difference (β=0.167, p< 0.01) is a result that is easily explained within existing research. The study found that people are more likely to go higher in the organization for informal learning. This result concurs with situated learning (Lave & Wenger, 1988), cognitive apprenticeship (Brown, Collins, & Duguid, 1989), and the apprentice model in general (Pratt, 1998). People look to those higher than themselves in the organizational hierarchy because those higher up presumably have more experience and knowledge about questions of importance. It is also interesting to note that the low β here suggests that participants did not go too far away in the hierarchy to get information. This also concurs with findings in the prevalence of near-peer learning found by Wenger (1998). Wenger discovered that new members within a community of practice tend to spend more time interacting with and learning from those who are only slightly more advanced than
themselves in regard to skill level. Learning is less likely to come from the experts, but instead form the ‘just-a-little-betters’.

A similar pattern exists with each of the Borgatti and Cross variables (as shown on Table 6). Training co-participation has a small-but-significant effect and some demographic variable or variables showed effects. The office variable showed an effect on those three variables, with β=0.227 for access, β=0.610 for knowledge and β=0.572 for value. This is not surprising, as Borgatti and Cross were partially inspired to their research because of a theorized mediation of the proximity variable by the three antecedent variables. They found that while proximity was a key variable in information seeking, knowledge and access mediated the effect of proximity. People were more likely to go to a close source if they knew their expertise and thought they would have time for them. Although the analyses to reinforce this finding were not done, it is reasonable to assume that it is likely the case, as the significant β for the individual variables and the non-significant β in the full MRQAP suggest it.

Training co-participation is the only other significant β for knowledge (β= 0.094, p< 0.05) and access (β= 0.076, p< 0.01). Again, both are small, but significant, giving a reason for cautious optimism about the effect that training co-participation has on knowing another’s expertise and assessments of accessibility. Even more reason for optimism is that training co-participation is the only variable that has a significant effect on these variables other than the well-established variable of proximity.

Value has a different regression result than access and knowledge. While both training co-participation (β= 0.119, p<0.01) and office (β= 0.572, p<0.001) were significant
for all the variables, department ($\beta = 0.112$, $p < 0.01$) and level difference ($\beta = -0.115$, $p < 0.01$) were also significant for value. Department’s role in value is intuitive—someone in my department is more likely to have expertise in areas that are important in the kind of work I do. It is easy to see how the same department increases the likelihood of expertise being important to the kind of work that colleagues do.

The level difference variable is not intuitive, however. This is because of the negative value of $\beta$. This means that there is a small, but significant, increase in valuing the expertise of colleagues who are below you in the organizational hierarchy. This result is hard to explain without further information, but it could be due to the research site being a fairly flat organization and that the first level in the survey—entry level—encompasses a diverse set of jobs – including individual contributors such as copy editor, web designer, and sales staff as well as positions traditionally considered “entry level” such as secretary and junior associates. Given the wide range of jobs included in the category, the fact that entry level has the largest proportion of respondents (39%) is not surprising, and could also contribute to the valence of the $\beta$.

Although this research was not originally intended to examine the new employee transition, the context of the study makes that a relevant area of application. Morrison (1993b) examined socialization of newly-hired employees and found that individuals tend to seek performance and technical information from supervisors and social references and normative information from peers. She also found that individuals with a large social network have more organizational knowledge and that individuals with a dense social network have more technical knowledge (Morrison, 2002). While these findings are
interesting. Morrison does not distinguish between fellow new-hires and tenured individuals, but only hierarchical level. And she also does not describe what, if any, shared training occurred. The research presented in this dissertation suggests that onboard training matters for information seeking behaviors and that the relationships with fellow new-hires are a valuable source of information.

**Implications for practice**

The results of this analysis are promising for both future research and practice. The analysis of training co-participation shows that there is a small, but significant effect on informal learning in this organization. Furthermore, the analyses of knowledge, value and accessibility also found small, but significant results. For the realm of practice, these small results have implications for evaluation, design and use of organizational training. For future research, these results provide a foundation to expand research into related topics, and examine informal learning with related methods.

The first data point for practice is this: formal training does influence informal learning in the organization. The effect is small, but current research suggests that the variables that effect informal learning behavior are not easy manipulated. Marsick and Watkins (2001) suggest three conditions that enhance informal learning, but these are individual skills: critical reflection, creativity and stimulation of proactivity. While these skills are valuable, they are difficult to train for in the organizational setting because the business case for them is not clear as these skills are distinctly in the category of “soft skills training.” Also, the fact that sharing training increases informal learning means that a training course has hidden value: not only is there the benefit towards the direct outcome of
the training, but there is also benefit to informal learning.

While formal training benefits informal learning, it also has a positive effect on knowing expertise, valuing expertise and assessments of accessibility. This is of note because these three variables can be utilized in ways other than informal learning. Knowing expertise helps build teams that have the correct capabilities. Higher accessibility enables better collaboration across an organization. Because accessibility is about likelihood to respond in time, a better assessment makes people more likely to reach out when time is constrained.

The results of this research can be used in three main ways by practitioners. First, this research can be a tool for arguing the value of face-to-face courses. These results should not be generalized to virtual courses without further research but, rather, the effect of training co-participation should be seen as a potential benefit of face-to-face training. Second, the results suggest a potential method for evaluating programs. Social network analysis creates a new method for evaluating social outcomes of programs such as networking. Also, because of the robust nature of social network analysis, other connections such as revenue sharing, work assignment or email exchanges can be evaluated in regard to the influence of training. For example, relational links in social network research have included co-authorship (Gersick, Bartunek & Dutton, 2000), marriages and business relations (Padgett, 1987), cellphone calls (Reader, et al 2011) and ‘social energy’ (Cross, Baker & Parker, 2003). Social Network Analysis allows for an analysis of a wide range of relationships, and with careful consideration, training’s influence can be examined in many ways.

The final way that practitioners can use these results involves how programs are
designed and delivered. With social outcomes for programs such as increased accessibility and informal learning a reality, program designs could be modified to increase the effect. For example, taking a cue from Sherif, et al. (1958) could increase shared identity. An increase in activities with shared goals and a decrease in internal competition in training programs would increase a shared sense of group, and by extension, the strength of later informal learning connections. One challenge with this implementation of the results is that further research is needed to understand what aspects of the programs had the most impact on informal learning.

**Limitations**

This research study has several limitations. These limits are due to the methodology, the population, and the instrumentation. The method and population were necessary compromises in order to acquire a research site. The research site was the second location that a study was run and the third that was approached for study. The first site approached went bankrupt soon after discussions started. The second site ran the study just after a merger was announced which resulted in a distracted and disinterested participant pool. Consequently, the response rate was too small to be analyzable.

The population for this study is limited in several senses. First of all, the organization is a professional services firm, with most work involving collaboration and shared production of non-physical products. Teams formed across functions work together to develop and evaluate interactive marketing strategies for clients, which requires the involvement of many business disciplines but no physical labor at all. The results of this study may not apply to more physically-bound industries such as publishing or manufacturing. They also may not
apply to less team-oriented firms within professional services. The client site was a matrix-based organization (Galbraith, 1971) that relied on cross-functional teams to deliver on client projects. While this is not uncommon, it is by no means universal in professional services.

A further limitation in the population is the fact that it is newly hired employees. This limitation changes the nature of the information being sought—more socialization information is sought in the early time in an organization than later (Feldman, 1981). Not only is different information sought in the first few months, but who is sought as a resource changes after that early period as well. Morrison (1993a) found that new hires used supervisors for technical reference and peers for social reference. Other models suggest that established employees look to peers for technical information more than supervisors (Wenger, 1998). Thus, the population in this study might skew the results towards supervisors instead of peers. This limitation would likely work in the favor of the results, however, as the training co-participants were more likely peers than direct reports.

Besides the fact that the population was recently hired to the organization, the age of the group is a potential limitation. This population had no employees over 50 in it and the modal age range is under 30. Given the recent changes in technology in the workplace and a continual shift away from Taylorian management, the results may be skewed by being represented primarily one generational group. The final limitation in the population is the size of the network and the boundary condition. Although not small compared to other network analyses, which can vary from under 10 participants to thousands, this study did examine a small group within the organization. Not only was it less than 30 people, but there is a possibility that there is a non-response bias. Roughly half of the possible network
members responded, which could skew the results. While the previously mentioned research by Kossinet (2006) suggests that 50% is an acceptable level of participation, higher participation would give a better result. Fortunately, Kossinet’s research shows that if there is a systematic bias in the non-response, it is that the sub-groups would be under-reported.

The methodology limitations are bound in the definition of terms. “Training co-participation” is a general term, but with a specific instantiation in the study. This training program had an express purpose of connecting participants, which is not a typical explicit outcome for training programs. This is related to the fact that measuring connections between participants requires more than the standard Kirkpatrick (1975) first level post-program evaluation that is prevalent in the field. The fact that the training program’s desired outcomes included a social connection between participants means that the argument of training programs in general is not as strong as it could be. Although the pedagogy of the course did not include anything out of the ordinary, the results of this study could be framed as a success for the specific program and not connected to any general principle of training co-participation.

Another definitional issue with the study is in the lack of specificity of the information seeking question. The question asks “Please indicate how often you have turned to this person for information or knowledge on work-related topics in the last 3 months.” “Work-related topics” is a wide-ranging area of knowledge that can include technical skills, socialization cues, political information, client knowledge and any other topic that the respondent deems relevant. “Work related information” does not qualify the importance of the information such that seeking information about a strategically important client would be
measured in the same way as seeking information about where the supply closet is. This ambiguity has an advantage in that it can capture more informal interactions than more specific questions, but this ambiguity means that the results could be dismissed as inconsequential.

The model is temporally ordered, but the analysis is fixed in time. Similar to many such analyses, this study only provides a snapshot of a phenomenon that evolves over time. It is possible that a time closer-to or farther-from the training would show different results. This limitation is inherent to all survey designs. Where the model is causal in that training co-participation leads to an increase information seeking, the analysis only allows for a showing a statistical relationship.

**Future Research**

Future research extending from this study falls into four main categories, best described by the element that would be changed from the current study. These include a change in the population, in the training program, in the study design, and in the type of connection analyzed. Each of these changes provides new insight into the measurement of social outcomes of training programs.

Examining different populations would help us understand how informal learning increases in different contexts. One question outstanding from the current research is that of the co-linearity of knowledge and value. These variables did not co-vary in the Borgatti and Cross research, so some difference must exist between the two groups they analyzed and the group analyzed here. Research repeating the study in different companies in different industries and professions would help us understand how the antecedents to informal
learning—knowing, valuing, and accessibility—vary in relation to work dynamics and organizational culture. Because knowing, valuing, and accessibility are social dynamics, one can easily imagine that the different social contexts of different fields could have a different effect on how those dynamics play out. The information seeking behavior in manufacturing may differ greatly from the same behavior in teaching, or consulting, or retail, because the way that the individuals are interdependent and have opportunities to seek information form one another is different in each of these industries.

Another way to vary the population is to examine the effect that training has on informal learning in well-established employees rather than recently hired employees. Research suggests that newly hired employees seek out information about socialization and culture as well as work performance (Morrison, 1993a), which could skew the results of the informal learning study. A study examining tenured employees would enable a deeper understanding of training’s effect on informal learning, and likely enable arguments to be made about primarily instrumental learning rather than relational learning.

To learn about the effect that training has on informally learning new instrumental knowledge, i.e. building specific skills instead of expressly learning culture and norms, we would need to change the programs examined. Examining two changes in program design would enhance future knowledge. First, change the content area of the training situation. The current study included a training program that was focused on the culture and history of the organization as well as making connections. Would a similar outcome occur with a training program that was focused on technical skills? How is the difference between the effect training has on informal learning correlated with the amount of social interaction
necessary to accomplish the work the training supports? For example, does the training for an audit process—a technical skill, and socially intensive in its execution—have a lesser or greater effect on informal learning than the training for radio antenna repair—a technical skill and not socially intensive in its execution. This question explores the social nature of learning outcomes. How do social dynamics such as the collaboration needed in an audit affect the increase in informal learning compared to the effects of learning together when the practice isn’t inherently social..

Another change in the program was already mentioned above. Changes in the design of the program may affect the program’s influence on informal learning behaviors. What pedagogical strategies inspire later information seeking between training co-participants? How does discussion, lecture, experiential training and the mix of them change the effect training has on informal learning later? Also, non-pedagogical choices may matter. Some evidence suggests that sharing meals increases a sense of identity (Ciunihan & Van Esterik, 1997). An additional feature of program design then becomes, “How does meal sharing change the effect of training co-participation on informal learning?” and “Does happy hour have a positive effect on later informal learning?”

One specific programmatic design change is particularly compelling. Given the challenges of integrating pedagogy and technology (e.g. Mehlenbacher, 2010, Chapter 7), the translation of training into a virtual space raises the question of whether the same sense of shared identity that face-to-face co-participation engenders will develop. In other words, does e-learning co-participation affect later informal learning? This is interesting particularly in large, distributed organizations where the cost of co-locating participants for a program is
high, the interactions likely to create informal learning after a program are often technologically mediated, and the work is distributed across time and social groups.

Besides changing the program and population, the study design could be changed in future research. This could help remedy some of the weaknesses of the study. For example, a future study with a pre-test and a post-test would create a more solid argument of the results of the study, creating a clearer picture of causation. That design change would change the possible conclusions, giving a much more specific insight into the efficacy of a given program on informal learning. Also, a limited-choice ego network analysis (Wasserman and Faust, 1994) would provide different insights into the importance of connections that are enhanced by training co-participation. The limited choice ego network focuses on a few – typically 5 or 10 – of the most likely individuals sought for informal learning. The resulting analysis would be more about the most sought actors instead of the overall network. This would provide insight into how training co-participation affects the most important learning relationships rather than all relationships.

The final way to expand this research is to look at how different outcomes are affected by training co-participation. Social network analysis allows for examination of connections between actors in various contexts. While this study focused on information seeking and informal learning, other research could examine how training co-participation affects other interactions of strategic importance. Ulrich and Smallwood (2005) point to an opportunity in human resources development to apply return on investment to intangible aspects of the organization. These intangible aspects are highly social in nature – keeping promises, aligning competencies, building value through people (Table 1, p. 139). A social
network analysis would facilitate a quantification of promises kept, the paths between complimentary competencies and how value flows through the organization. An example of this was demonstrated at the first potential research site. They examined how training co-participation affected the shared revenues of investment bankers, but unfortunately declared their findings proprietary.

**Conclusion**

The increased interest in studying and fostering informal learning in the organization has created a situation where researchers and consultants present informal learning and formal training as opposing processes. This study was inspired by the idea that these two organizational learning processes are complimentary and that formal training can have an influence on informal learning. The results of this study also suggest that, indeed, co-participation in training programs can affect informal learning in the organization.

Part of the challenge with informal learning is the field’s practice of defining it as ‘not in the classroom.’ Part of the problem with understanding the effect of training on informal learning is the assumptions that our existing evaluation models have about training as a contained event and about the omission of social outcomes from our examinations of training influences? This dissertation defines informal learning in a way that does not present it as antithetical to training, and it evaluates training outcomes on the relationships between participants.

My results show that, indeed, training and informal learning are connected, and that social analysis adds to the understanding of the impact of a training program. A change in the model of learning—from a classroom-centric model to one that assumes that learning is an
intrinsic practice of employees—will help organizations develop better training and learning opportunities for individuals. A new practice of analysis that includes social network analysis will help researchers and practitioners elaborate on the value of aspects of training and learning that have historically been dismissed as ‘soft’ or that have been overlooked altogether, thus strengthening the case for organizational training and learning initiatives.
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Appendix A: Survey

Participants will be asked a series of demographic questions:

What is your Gender

Male
Female

What is your Age?

Under 21
21-25
26-30
31-35
36-40
41-45
46-50
Over 50

What level is your position?

Entry Level
Supervisor Level
In which department do you belong?
17 Departments listed, specific names withheld at request of research site

In which office do you primarily work?
Telecommute
Charlestown, MA
Reno-Tahoe
Salt Lake City
London, UK
Singapore

Participants will then be shown a list of the names of those employees who have consented to participate in the study, and asked the following question:

Please check the box next the names of people for whom this statement is true:
“I have interacted with this person in at least once the last 3 months, including casual interactions not directly related to work.”

After checking the names on the list, the participants will proceed to a series of individual pages one for each of the co-workers the respondent has acknowledged knowing. They will be asked 5 questions about each of these employees:

I understand this person’s knowledge and skills. This does not necessarily mean that I have these skills or am knowledgeable in these domains, but that I understand what skills this person has and domains they are knowledgeable in.

1 = Strongly disagree, 5 = Strongly agree

This person has expertise in areas that are important in the kind of work I do.

1 = Strongly disagree, 5 = Strongly agree

When I need information or advice, this person is generally accessible to me within a sufficient amount of time to help me solve my problem.
1=Strongly disagree, 5=Strongly agree

Please indicate how often you have turned to
this person for information or knowledge on work-related
topics in the past 3 months.
1 = Never, 5 = Very frequently,

Please indicate how often this person has
turned to you for information or knowledge on
work-related topics in the past 3 months.
1 = Never, 5 = Very frequently,

Appendix B: Recruitment Email

Dear NAME,

My name is Joe Houde and I am conducting a study on networking in organizations
for my doctoral dissertation at NC State University. <REDACTED> has given me
permission to survey employees who have been recently hired to <REDACTED>. The purpose of my research is to increase our understanding of how people learn
from one another inside an organization.
Your participation in this study is completely voluntary; it is not a job requirement. However, in order for this research to be effective I need as many people as possible to participate. The information you provide will be completely confidential; it will not be possible for others to identify any individual respondents in the data, and all reports will be in the aggregate.

When the study is complete I will provide <REDACTED> with an anonymous networking map that summarizes the informal learning connections that take place inside the organization. My hope is that this will ultimately serve to strengthen and improve both the work environment and your ability to accomplish your goals. Depending on how many employees in the subject group you know, it could take up to 45 minutes to complete the survey. Most people will be able to complete it in significantly less time. And, if you need to, you can take the survey in more than one sitting. I appreciate that this might seem like a lot of time, but, in order to get a thorough analysis of informal networking in your company it is important that as many people as possible participate in the survey.

For your privacy, if you step away from your computer when taking the survey I would encourage you to minimize the window and lock your computer.

Please click here to go to the survey
URL
The survey will be open until

If you have any questions please contact me at 919.491.5768 or jhoude+edd@gmail.com.

Thank you for your help,

Joe

Appendix C: Reminder Email

Dear NAME,

This note is a reminder for those that have not yet filled out the survey on informal networking in organizations.

The survey will ask some demographic questions and then ask you to identify employees you know from <REDACTED>. You will then be asked a few questions about each person you know.

Depending on how many employees you know, it could take up to 45 minutes to complete the survey. Most people will be able to complete it in significantly less time.
I appreciate that this might seem like a lot of time, but, in order to get a thorough analysis of informal networking in your company it is important that as many people as possible participate in the survey. And, if you need to, you can take the survey in more than one sitting.

For your privacy, if you step away from your computer when taking the survey I would encourage you to minimize the window and lock your computer.

Please click here to go to the survey URL

If you have any questions, please contact me at 919.491.5768 or jhoudieedd@gmail.com

Thank you,

Joe

**Appendix D: Reminder for survey II**

Dear NAME,

This is a final reminder for the survey about informal networking at <REDACTED>. Thank you to all that have filled out the survey already. If you haven’t, please take the time before the survey closes on DATE.
As a reminder, it could take up to 45 minutes to complete the survey, but most people will be able to complete it in significantly less time. And, if you need to, you can take the survey in more than one sitting.

For your privacy, if you step away from your computer when taking the survey I would encourage you to minimize the window and lock your computer.

Please click here to go to the survey URL

If you have any questions, please contact me at 919.491.5768 or jhoude@gmail.com

Thank you,

Joe

Appendix E: Analysis without Knowledge Variable
MULTIPLE REGRESSION QAP VIA DOUBLE DECKER SEMI-PARTIALLING

# of permutations: 10000
Diagonal valid: NO
Random seed: 213
Dependent variable: info seek
Expected values: mrap-predicted (C:\\users\\joe\\dropbox\\1
Data\\mrap-predicted)
Independent variables: C:\\users\\joe\\dropbox\\1 Data\access
C:\\users\\joe\\dropbox\\1 Data\value
C:\\users\\joe\\dropbox\\1 Data\group-mat
C:\\users\\joe\\dropbox\\1 Data\age-mat
C:\\users\\joe\\dropbox\\1 Data\gender-mat
C:\\users\\joe\\dropbox\\1 Data\level diff-mat
C:\\users\\joe\\dropbox\\1 Data\office-mat
C:\\users\\joe\\dropbox\\1 Data\tenure diff-mat

Number of permutations performed: 10000

MODEL FIT

<table>
<thead>
<tr>
<th>R-square</th>
<th>Adj.R-Sqr</th>
<th>Probability</th>
<th># of Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.319</td>
<td>0.310</td>
<td>0.000</td>
<td>650</td>
</tr>
</tbody>
</table>

REGRESSION COEFFICIENTS

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<tr>
<th>Std Err</th>
<th>Un-stdized Coefficient</th>
<th>Stdized Coefficient</th>
<th>Significance</th>
<th>Proportion As Large</th>
<th>Proportion As Small</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>Intercept access</td>
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<td>0.356744</td>
<td>0.387749</td>
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<td>0.044414</td>
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<td></td>
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<tr>
<td>group-mat</td>
<td>0.171502</td>
<td>0.189793</td>
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<td>0.0134</td>
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<td>0.156275</td>
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<td>age-mat</td>
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<td>0.3736</td>
<td>0.6265</td>
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<td>0.150980</td>
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<td></td>
</tr>
<tr>
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<td>-0.086887</td>
<td>0.0035</td>
<td>0.0966</td>
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<td>0.116795</td>
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</tr>
<tr>
<td>level diff-mat</td>
<td>0.171110</td>
<td>0.179574</td>
<td>0.0053</td>
<td>0.0053</td>
<td>0.9948</td>
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<tr>
<td>0.072573</td>
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<tr>
<td>office-mat</td>
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<td>0.8868</td>
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<td>0.174788</td>
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<tr>
<td>tenure diff-mat</td>
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<td>0.014600</td>
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Running time: 00:00:41
Output generated: 23 Jan 12 00:15:18
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Appendix F: Analysis without Value Variable
MULTIPLE REGRESSION GAP VIA DOUBLE DERRER SEMI-PARTIALLING

# of permutations: 10000
Diagonal valid? NO
Random seed: 612
Dependent variable: info seek
Expected values: mrgap-predicted (c:\users\joe\dropbox\1
Data\mrgap-predicted)
Independent variables: C:\\users\\joe\\dropbox\\1 Data\\access
C:\\users\\joe\\dropbox\\1 Data\\knowledge
C:\\users\\joe\\dropbox\\1 Data\\group-mat
C:\\users\\joe\\dropbox\\1 Data\\age-mat
C:\\users\\joe\\dropbox\\1 Data\\gender-mat
C:\\users\\joe\\dropbox\\1 Data\\level-diff-mat
C:\\users\\joe\\dropbox\\1 Data\\office-mat
C:\\users\\joe\\dropbox\\1 Data\\tenure-diff-mat

Number of permutations performed: 10000

MODEL FIT
R-square Adj R-Sqr Probability # of obs
0.324 0.315 0.000 650

REGRESSION COEFFICIENTS

<table>
<thead>
<tr>
<th>Independent</th>
<th>Un-stdized Coefficient</th>
<th>Stdized Coefficient</th>
<th>Significance</th>
<th>Proportion As Large</th>
<th>Proportion As Small</th>
</tr>
</thead>
<tbody>
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<td>1.0000</td>
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<td>0.0001</td>
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<tr>
<td>office-mat</td>
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Running time: 00:00:33
Output generated: 23 Jan 12 00:20:18
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Appendix G: Analysis with Knowledge and Value Combined
ucinetlog2

TO MULTIPLE REGRESSION QAP VIA DOUBLE DECKER SEMI-PARTIALLING

# of permutations: 10000
Diagonal valid? NO
Random seed: 318
Dependent variable: Info seek
Expected values: mqq=qk- kv all (c:\users\joe\dropbox\1

Independent variables:

Data\numpy\all Data\access
C:\\users\\joe\\dropbox\\1 Data\access
C:\\users\\joe\\dropbox\\1 Data\k
C:\\users\\joe\\dropbox\\1 Data\group-mat
C:\\users\\joe\\dropbox\\1 Data\results\age-mat
C:\\users\\joe\\dropbox\\1

Data\results\gender-mat
diff-mat
C:\\users\\joe\\dropbox\\1 Data\results\level
diff-mat
C:\\users\\joe\\dropbox\\1 Data\results\office-mat
diff-mat
C:\\users\\joe\\dropbox\\1 Data\results\tenure

Number of permutations performed: 10000

MODEL FIT

R-square Adj R-sqr Probability # of obs
0.323 0.315 0.000 650

REGRESSION COEFFICIENTS

<table>
<thead>
<tr>
<th>Independent</th>
<th>Un-stdized Coefficient</th>
<th>Stdized Coefficient</th>
<th>Significance</th>
<th>Proportion As Large</th>
<th>Proportion As Small</th>
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<tbody>
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<td>1.0000</td>
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<td>level</td>
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<td>0.172037</td>
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<td>0.0006</td>
<td>0.9936</td>
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<tr>
<td>diff-mat</td>
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<td>0.2161</td>
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<tr>
<td>office-mat</td>
<td>0.065259</td>
<td>0.020511</td>
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Running time: 00:00:33
Output generated: 26 Feb 12 15:28:15