Tie Strength and the influence of Perception:

Obtaining diverse or relevant information.
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Abstract
There is a debate in social network theory concerning the information benefits generated by strong and weak ties. Moreover there is a gap in the literature concerning the inclusion of individual characteristics in theorizing about the effects of characteristics of social network structure. This study addresses these concerns by first of all hypothesizing that tie strength has a negative effect on the diversity of information and a positive effect on relevant information. Information in this study is work related. Furthermore it is hypothesized that the utility of network connection positively moderates the relationship between tie strength and the dependent variables. The results are interesting: weak ties will lead to diverse and relevant information on work related topics and the utility of network connection will increase these effects. The hypotheses are tested in one chemical organization and a dyadic level of analysis is used.

Acknowledgements
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1. Introduction

‘Social relations, often established for other purposes, constitute information channels that reduce the amount of time and investment required to gather information’ (Nahapiet and Ghoshal, 1998, p.252). It is clear that people can provide information that directly solves a problem or answers a question (Cross, Rice and Parker, 2001), how to acquire information benefits
from relationships is however less clear. Information benefits which result from relationships are one of the key forms of social capital according to Adler & Kwon (2002). ‘An extensive literature has examined how this form of social capital leads to a variety of positive outcomes for managers, such as faster promotions and higher levels of compensation’ (Anderson, 2008, p.52). A greater access to relevant and diverse information leads to a greater ability for managers to make sense of their environment, to notice emerging trends and problems and to achieve higher performance (Anderson, 2008). In the literature diverse and relevant information are often named and used together (Anderson, 2008; Hansen, 1999).

However there is a debate in the literature about the occurrence of these information benefits due to the strength of ties (e.g. Rindfleish & Moorman, 2001). It has been argued that tie strength affects actors’ access to information (Gabbay & Leenders, 2001). Some argue that strong ties will lead to a greater amount and diversity of information (e.g. Rindfleish & Moorman, 2001), whereas others argue that weak ties will yield these benefits (e.g. Granovetter, 1973). ‘Tie strength is a combination of the amount of time, the emotional intensity, the intimacy (mutual confiding) and the reciprocal services which characterize a relationship’ (Granovetter, 1973, p. 1361) and there is a range from weak to strong ties.

This research contributes to this debate by distinguishing between diverse and relevant information and by hypothesizing different effects of tie strength on these variables. By distinguishing between diverse and relevant information this research responds to the statement of Anderson (2008) when he stated that ‘the distinction between these variables warrants more attention’ (p.69). This will be further explained in the theory section. Information is diverse when it is different from the information the actor already had concerning work related topics (Anderson, 2008). Relevant information concerns the relevant information for a work assignment (Anderson, 2008).

Moreover this study contributes by responding to the lack of including individual characteristics in the literature that discusses the effects of social network structure (Anderson, 2008; Kilduff & Brass, 2010; Obstfeld, 2005). ‘The mere fact of a tie implies little about the likelihood that social capital effects will materialize’ (Adler and Kwon, 2002, p. 25). The individual characteristic central in this study is individual perception and is included since people do not perceive and think about the social world, as would be expected from the information they receive and from their formal logic (Higgins & Bargh, 1987). Previous research has consistently shown that there are several systematic biases in individuals’ perception and cognitive organization of their social group (Kumbasar, Romney & Batchelder, 1994). Individuals’ perceptions of others’ knowledge and skills, informs who they turn to for
particular issues, even if their perception is inaccurate (Borgatti & Cross, 2003). **As a consequence the utility of network connection is hypothesized to influence the effect between tie strength and diversity and relevance of information.** Utility of network connection is ‘the belief that social networks provide the opportunities and constraints that affect outcomes of importance to individuals and groups’ (Kilduff & Brass, 2010, p.319). In this study this refers to the utility of network connection for contributing to work related problems and issues for the focal actor.

Getting more insight in the effect of the strength of ties combined with individual perception can create a deeper understanding of how actors can or cannot benefit from their relations. It is for individuals and organizations important to know which mechanisms generate particular information benefits. When known individuals and organizations could intervene to get the effects they want. Possible areas of intervention are awareness of the utility of network connections and the formation/development of strong and weak ties.

First of all this study investigates the effect of tie strength on diversity of information and on relevant information on work related topics. Further the interaction effect of tie strength and the utility of network connection on the dependent variables is studied. This results in the following research question: To what extent does the utility of network connection moderates the effect of tie strength on the diversity of information and on the relevance of information?

### 2. Theory

#### 2.1 Tie strength

This study examines the relational dimension of social capital, which consists of the strength of a person's interpersonal exchange relationships (Nahapiet & Ghoshal, 1998). ‘The strength of relations indicates how well an individual knows his or her exchange partners’ (McFadyen & Cannella, 2004, p.736). Granovetter (1973) defined tie strength as ‘a combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie’ (p.1361). A lot of authors use the definition of Granovetter (1973) so this study perceives this definition to be valid and uses this definition accordingly (e.g. Hansen, 1999; Marsden & Campbell, 1984; Reagans & McEvily, 2003). There is a range from weak to strong ties.
2.2 Information resulting from ties: information diversity and relevant information

Information in this study means that it will lead to immediate progress on a current assignment or project, which reflects the definition of actionable knowledge (Anderson, 2008; Cross & Sproull, 2004). In the literature concerning tie strength and information benefits a lot of information benefits are mentioned which sometimes refer to very different topics. Examples include information leading to innovation (Rindfleish & Moorman, 2001), relevant information (Hansen, 1999), novel information (Nelson, 1989), redundancy (Coleman, 1988) and creativity (Burt, 2005). Information benefits are assumed to be the intervening causal mechanism that produces social network effects, but research has not convincingly shown that social network characteristics actually lead to a greater amount and diversity of information (Anderson, 2008, p.52). An explanation for this could be the recognized difficulty of measuring information (Anderson, 2008) and because social network research not always directly measures the outcomes of social network structure (Anderson, 2008; Hansen, 1999; Rindfleish & Moorman, 2001). ‘However, the enormous importance that information access plays in the literature suggests that more thorough empirical investigations are warranted’ (Anderson, 2008, p.52). He further argues that the existing social networks literature focuses much more on the benefits of diverse information than on the benefits of relevant information and that this distinction needs more attention. ‘While diverse information often leads to new insights, it can also prove irrelevant and unhelpful, or lead to conflict (Anderson, 2008, p. 69-70)’. For example when the information is relevant for the work related problem but too diverse in order to be used appropriately the net result will be that the information cannot be used. This is due the premise of the notion of absorptive capacity that some prior related knowledge is needed to assimilate and use new knowledge (Cohen & Levinthal, 1990). Therefore this study explicitly distinguishes between the diversity of information and the relevance of information.

This study argues that tie strength will influence the diversity of information and the relevance of information in opposite ways. The diversity of information reflects the extent to which the information that is received through a relationship is different from the information the actor already had and leads to immediate progress on a current (work) assignment or project (Anderson, 2008). Other studies like Nelson (1989) and Cross et al. (2001) referred to the extent to which the information is different from the information the actor already had, but did not provide clear definitions. Like just stated this can be due the fact that outcomes of network structure are not always directly measured (Anderson, 2008; Hansen, 1999; Rindfleish & Moorman, 2001). This also clarifies the fact that not many definitions could be
found for the relevance of information.

Cross & Sproull (2004) and Hansen (1999) refer to relevant information as the information being relevant for the individuals in the organization/network. However Anderson (2008) is more specific and defined the amount of relevant information for a work assignment and is therefore used in this study.

There are contradicting opinions about the effects of the strength of ties. According to theory weak ties lead to more diverse information compared to strong ties which will lead to more redundant information (Burt, 1997; Granovetter, 1973). Anderson (2008) argues that weak ties are less likely to know each other. ‘Network diversity increases as an individual's network connections are distributed more evenly across multiple areas of expertise and ties among people in the same area of expertise are weak’ (Reagans & McEvily, 2003, p.257). However McEvily and Zaheer (1999) argue that in an alliance context strong ties also lead to non redundant information and there are authors questioning the traditional view on weak ties (e.g. Hansen, 1999). Cross and Sproul (2004) state for example that weak ties could lead to non redundant information, but without trust in a relationship this effect will be nonexistent. Despite these contrasts this study finds the arguments in line with Granovetter (1973) more convincing since weak ties imply that the combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie are low and so it is more likely that weak ties will lead to diverse information instead of strong ties since they interact less frequently and are less close to each other. Moreover comparing the theoretical arguments for generating diverse information through the strength of ties, less arguments supporting diversity as a result of strong ties could be found. Therefore I hypothesize:

**Hypothesis 1**: Tie strength is negatively correlated to the diversity of information.

It is expected that weak ties are related to a larger network size, because weak ties are less costly to maintain in terms of the interaction resources individuals have and because it is less likely that an actor’s weak ties know one another (Anderson, 2008). In addition a greater number of ties make it more likely that an actor will have relevant information (Anderson, 2008). Interestingly individuals who have strong ties are more likely to share information than weak ties and are more willing to spend time and effort on behalf of each other (Krackhardt, 1992; Reagans & McEvily, 2003). More frequent communication can lead to more effective communication through the development of relationship-specific heuristics (Uzzi, 1997).
‘Strong interpersonal attachments also facilitate the formation of trust, which may further ease the transfer of knowledge’ (Reagans & McEvily, 2003, p.244). Considering these arguments it may be that weak ties lead to a greater amount of information, but strong ties will lead to a greater amount of relevant information. This is expected because as stated strong ties can be more effective, due to heuristics and trust. Moreover they are more likely to spend time and effort and are thus more likely to provide relevant information. Hence:

**Hypothesis 2**: Tie strength is positively correlated to the relevance of information.

2.3 **Utility of network connection.**

This study argues that the above hypotheses are based on sound theoretical arguments, but that the individual perception of the actor influences the extent in which the social capital effects will materialize (Adler & Kwon, 2001). There is a growing attention to how perceptions of networks are themselves constitutive of action (Kilduff & Brass, 2010). This study pays attention to this by investigating to what extent the perception of the utility of a network connection influences the activity in using ties and consequently the acquisition of diverse and relevant information. The utility of network connection is defined as ‘the belief that social networks provide the opportunities and constraints that affect outcomes of importance to individuals and groups’ (Kilduff & Brass, 2010, p.319) and is related to the usefulness of a network connection for helping with work related issues and problems.

This study theorizes about beliefs and perceptions instead of actual characteristics since perception influences behaviour (Borgatti & Cross, 2003) and because there are biases in individuals' perception (Kumbasar et al., 1994). Moreover like Choo (1996, p.331) argued that ‘in an ideal world, rational choice would require a complete search of available alternatives, reliable information about their consequences, and consistent preferences to evaluate these outcomes’. However in actual life, such demands are not realistic (Choo, 1996). Individuals’ perceptions of others' knowledge and skills, informs who they turn to for particular issues, even if their perception is inaccurate (Borgatti & Cross, 2003). An example of the possible effect of perception on individual action is mentioned by Kilduff & Brass (2010) when they state that people are not likely to form relationships with people whom they perceive as trying to use them. So here the perception influences actual behaviour in using network connections.

It is expected that the utility of network connection has three dimensions, knowing: the extent to which an actor thinks to know the other’s expertise, value: the extent in which the
actor thinks that the other’s expertise is valuable for his/her work and access: the extent in which the actor perceives to have timely access to that person's thinking (Borgatti & Cross, 2003). These dimensions are derived from Borgatti & Cross (2003), but are not measured before as being one variable. This study wants to test if they are one variable and the logic follows by quoting sentences of Borgatti & Cross (2003) and putting them after each other.

First of all Borgatti & Cross (2003) propose a model with these variables which implies an interrelationship. They state that ‘awareness of an individual as a possible source in light of a current problem or opportunity is a baseline condition for using a network connection’ (p.434). Further they say that it is also important that the knowledge and skills of the other actor are positively evaluated.

That is, 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. (p.434)

The former imply interrelationships among these three and is further supported by the following statement: ‘discovering that a person is not helpful, reduces the probability of interacting with them, which means that knowledge of their expertise and how best to access them begins to fade’ (Borgatti & Cross, 2003, 442).

Individually these variables proved to influence the individual activity in using ties: knowing (Borgatti & Cross, 2003; Cross & Cummings, 2004), value (Borgatti & Cross, 2003; Nahapiet & Ghoshal, 1998) and access: (Borgatti & Cross, 2003). In Nahapiet & Ghoshal (1998) the creation of new intellectual capital through combination and exchange was increased through value, in Borgatti and Cross (2003) information seeking through knowing, value and access and in Cross and Cummings (2004) the ability to respond appropriately when new projects demanded different knowledge through knowing. Depending on the range in which an actor thinks to know the other actor’s expertise, value and accessibility the actor’s ties will be used more or less and more or less diverse and/or relevant information concerning work related topics could be acquired through either weak or strong ties.

This means that the utility of network connection can either strengthen or lower the effect of tie strength on the diversity of information and on relevant information on work related topics. When an actor perceives a tie (weak/strong) to be useful, e.g. thinks to know his/her expertise, value and accessibility the actor will be more likely to use that tie than when the actor perceives the tie (weak/strong) to be rather useless, because the actor would prefer (expected) benefits instead of losses (Williamson, 1981). This logic holds for the diversity and
relevance of information. Tie strength is a relational variable and the utility of network connection concerns perceptions about the utility of a connection for one's work. So the first is relational and the second work related. ‘Simply knowing that someone has relevant expertise is not all that is required to obtain useful information from that person’ (Cross & Sproul, 2004, p.452). They further argue that ‘at a minimum, acquiring information from someone requires his or her cooperation, which is a function of the relationship that one has with that person’ (p.452) which further indicates an interaction between tie strength and utility of network connection. Hence:

**Hypothesis 3**: The utility of network connection moderates the relationship between tie strength and the diversity of information in such way that the higher the utility of network connection the more significant the relationship between tie strength and the diversity of information, the lower the utility of network connection the less significant the relationship between tie strength and the diversity of information.

**Hypothesis 4**: The utility of network connection moderates the relationship between tie strength and the relevance of information in such way that the higher the utility of network connection the more significant the relationship between tie strength and the relevance of information, the lower the utility of network connection the less significant the relationship between tie strength and the relevance of information.

3. Methods

3.1 Research design, data collection and sampling.

This research has a cross sectional design and used online surveys to gather quantitative data. The surveys were online for two weeks. This is a deductive study in which hypotheses are generated on the basis of current literature concerning the research topic (Bryman, 2008). The unit of analysis is the dyad and the unit of observation is the individual. Social network data was collected in one chemical organization to test the hypotheses. The population in this study is an organization with 103 employees. Four departments consisting of 46 employees were asked to participate in the survey. Preliminary meetings indicated that these departments interacted with each other concerning work related topics. The questionnaires included a covering letter from the management team. The sampling strategy used is stratified random sampling, because it was important that the sample accurately represented the four departments to get a representative view of the four departments (Bryman, 2008).
The criterion of sampling was the department and the unit of analysis was a tie, so one respondent could report several relationships. It was not feasibly to let every respondent fill in the questionnaire for 45 employees, so subgroups of the sample were made on the basis of systematic sampling (Bryman, 2008).

The average amount of respondents in one department was 11.5. A systematic sample of thirteen employees was generated by systematically including three or four respondents from each department. One of the four departments was their own. There was no inherent ordering of the sampling frame, so there was no bias in the resulting sample (Bryman, 2008). So each respondent could report 13 relations at maximum. The number of possible relationships in one survey was thirteen, because otherwise not all respondents would be included in the survey and to limit respondent fatigue (Anderson, 2008).

The first question of the survey was: From which person/persons did you receive work related information in the past three months? The respondents needed to fill in the other questions concerning tie strength, utility of network connection, diversity of information and relevant information for the persons that they had selected in the first question. The questions had a matrix layout. Further there were four surveys with four different lists of names of respondents, so that all the respondents were represented in the survey.

To make sure that the respondents did not get too comfortable to all positive or all negative statements, which could lead to automatic denial or confirmation of these statements without carefully reading them, some statements were formulated positively and other statements negatively (Sekaran, 2003). Also, the questions were hustled which means that the questions about the same topic were not in a consecutive order so that the respondents were forced to read every statement carefully before ranking it on the Likert scales (Sekaran, 2003).

### 3.1.1 Response rate

To make the survey more attractive, a good covering letter was written, explaining the reasons for this research: why it is important, why the recipient has been selected, and providing a guarantee for confidentiality (Bryman, 2008). Confidentiality was provided by attaching codes to the respondents, to which only the researcher had access. The works council was informed and the cover letter was signed by the management team and with Tilburg University. Also, an attractive layout was made to increase the response rate. Moreover the researcher presented the research to the management team of the organization in order to get permission and to get their commitment. Before the time that the questionnaire was online the research was also introduced in meetings of the departments through presentations and individuals.
were approached if it was not possible to reach a department in a short notice. Also respondents were briefed during the time that the survey was online if they could not be reached before. Further, one reminder was send a week for the deadline of the survey which increased the response rate significantly (Bryman, 2008). All mentioned actions were done to increase the commitment of the respondents and the response rate. The response rate was 83% and resulted in 235 relationships. Moreover 63% of the respondents filled in the questionnaires completely. Next, the way in which the key concepts are measured will be described.

3.2 Measurement of the variables

3.2.1 Tie strength

This study uses a conventional network measure to measure tie strength (Hansen, 1999). Tie strength is measured by taking the average of the frequency and closeness scores as reported on 7-point Likert-type scales. Five and seven points Likert scales are common scales, however a 7 points Likert scale could result in more variance in the scores of the variable (Bryman, 2008). Tie strength is measured as a continuous variable. The correlation between frequency and closeness was 0,83 in the study of Hansen (1999) and in this study the correlation was 0.64 and the Cronbachs alpha of the scale was 0.77.

3.2.2 Utility of network connection.

This variable was measured through 3 dimensions: (1) knowing: perception of another person’s expertise, (2) valuing the other person’s expertise in relation to one's work, and (3) thinking to be able to gain timely access to that person's thinking (Borgatti & Cross, 2003). Per dimension three questions were posed on a 5 points Likert scale and the average score for each dimension was measured (Borgatti & Cross, 2003). Borgatti & Cross (2003) did not provide an argument for using a 5 points Likert scale. This study used a five points Likert scale for this variable, because nine items measured this variable and consequently nine matrices were needed. Two questions/matrices were combined in one format with two columns to shorten the length of the questionnaire. However when there was a seven points scale the layout was very unattractive. Therefore a five points Likert scale was chosen for this variable, which was more attractive for the respondents which is important for increasing the response rate. However it is recognized that a seven points likert scale could have resulted in more variance for this variable (Bryman, 2008).

Factor analysis indicated that knowing, value and access measure utility of network connection. The valid sample size was 181. The correlations in the correlation matrix were all
higher than 0.3, Bartlett’s Test of Sphericity was very significant (0.000) and the KMO index was 0.89. Furthermore one component was extracted using the Scree plot and the component matrix (Pallant, 2007). The reliability analysis showed a Cronbach’s alpha of 0.92 which is very high and indicates a reliable scale. No specific items were deleted. This indicates that this study proved that the utility of network connection consists of three dimensions and found a reliable scale to measure it. Finally one variable was constructed by taking the average of the scores of the 9 items for all respondents.

3.2.3 Diversity of information

This measure rates how diverse the information concerning work related topics received from each actor was. This variable is called Diversity of Information (Anderson, 2008). This variable is also measured by a seven points Likert scale and the average score was computed using 1 item. During discussions with the organization about the three questions used in the survey there was some confusing considering the questions for this variable. They seemed to understand one item better than the other. This could be clarified by looking at the wording of the variable in Anderson (2008) from which the questions were derived. Anderson (2008) argues in his hypotheses about the diversity of information. In the appendix in which he shows an example of his data collection he used the word ‘novelty’ instead of diversity and describes this as the extent to which the information is different from the information the actor already had. Because of this somewhat inconsistency only the item that Anderson (2008) used was applied in this study.

3.2.4 Relevant information

Relevant information rates how much relevant information is received from each source on work related topics (Anderson, 2008). This variable is also measured by a seven points Likert scale and the average score was computed using one question (Anderson, 2008).

3.2.5 Control variables

This study also collected demographic data to construct dyadic control variables. Data on tenure, gender, working in which department and data on working for a particular plant were collected. The first control variable is unit proximity. ‘Access to information in organizations is to some degree conditioned by structure and hierarchy’ (Cross & Cummings, 2004, p.928). Unit proximity is therefore included since it refers to occupying positions within the same functional department (Cross et al., 2001). They provide two arguments for the development of helping relationships within a work unit. ‘First, workgroup members tend to be
peers, and employees rely on peers for job-related information, because they are less likely to lose face by admitting ignorance to an individual of equal status’ (Cross et al., 2001, p.440). ‘The second reason that information sharing should develop among workgroup members is because such people belong to the same functional sub-culture and hierarchical position, and thus, are likely to share similar perceptions and have similar needs and information resources’ (Cross et al., 2001, p.440). When individuals operate in the same functional department the score = 1 and if not the score is 0 (Cross et al., 2001). In this study unit proximity is measured for working in the same department and for working in the same plant or not. Unit proximity for working in the same plant is measured differently, because it was also possible that employees had responsibilities for both plants what influences the unit proximity. Therefore if individuals worked for the same plant the score is 2, if individuals partly worked for the same plant the score is 1 and if they worked for different plants the score is 0.

The third control variable is tenure difference and is included because, ‘according to the communities of practice literature, newer members should know less and, therefore, will be less likely to be sought for information’ (Borgatti & Cross, 2003, p.438). New employees need first to go through organizational socialization which is ‘the process by which an individual acquires the attitudes, behavior, and knowledge she or he needs to participate as an organizational member’ (Morrison, 2002, p. 1149). For each pair of persons, the amount of months that j (the person from which information is acquired) works for the organization is subtracted from the amount of months i (the respondent) works for the organization (Borgatti & Cross, 2003).

Gender homophily is included since it is a well-established factor affecting communication frequency which means if the individuals in the dyad have the same gender or not (Borgatti & Cross, 2003). In the case of gender homophily, if the person i and j have the same gender the score is 1 when they do not the score is 0 (Borgatti & Cross, 2003). Table 1 shows the concepts, dimensions and example questions for the variables in this study.

Table 1: Questionnaire items for variables

<table>
<thead>
<tr>
<th>Concept</th>
<th>Dimensions</th>
<th>Question</th>
</tr>
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<tbody>
<tr>
<td>Tie strength</td>
<td>Frequency</td>
<td>How frequently do (did) you interact with this person?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1= once every third months, 2 = once every second month, 3 = once a month, 4 = twice a month, 5 = once a week, 6 = twice a week, 7= once a day.</td>
</tr>
</tbody>
</table>
### 3.3 Data analysis

First of all missing data were checked, outliers were identified and some variables were transformed and descriptive tables were made, in order to generate an overview of the data from the survey. The replies of the respondents of the scores on each item were collected.
and the scores for each item were aggregated to form an overall score (McCall, 2001). In addition preliminary analysis for checking the assumptions of multiple regression (Pallant, 2007) showed no signs of multicollinearity. Several checks were done to verify that the assumptions of the regression model were met, including examining Variance Inflation Factor (VIF) values, Tolerance, residual plots, and normal probability plots of the residuals (Pallant, 2007).

Correlation and regression analyses were used to test the model statistically. Correlations were computed using SPSS and the regressions were run with Ucinet (Borgatti, Everett, & Freeman, 2002). ‘Network data do not satisfy assumptions of statistical inference in classical regression because the observations are not independent’ (Borgatti & Cross, 200, p.438). Consequently, a special procedure named Multiple Regression Quadratic Assignment Procedure (MRQAP) was used to run the multiple regressions (Krackhardt, 1988). MRQAP is a regression by the program Ucinet (Borgatti et al., 2002). MRQAP uses a randomization/permutation technique to construct significance tests and significance levels for regressions and these are based on distributions generated from 2000 random permutations (Borgatti & Cross, 2003). MRQAP proved to be robust against multicollinearity (Dekker, Krackhardt & Snijders, 2003). There were different missing values for the particular variables as shown in table 2. From this table it can be derived that the respondents suffered from fatigue when filling the whole questionnaire, because in the questionnaire there were first asked questions concerning the independent variables and then the questions concerning the dependent variables. The percentage of the missing values increases for the variables that were more at the end of the questionnaire. Further the table shows percentages of 0% of missing values for the control variables since these were computed by the researcher with data from the organization. Ucinet does not provide a possibility to do something with the missing values in the data. There is no option to select cases pair wise or list wise as is the case in SPSS (Pallant, 2007). Instead Ucinet replaces the missing values of one variable with the average score of that variable (Borgatti et al., 2002).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Percentage of missing values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tie strength</td>
<td>3,4%</td>
</tr>
<tr>
<td>Utility of network connection</td>
<td>6,8%</td>
</tr>
<tr>
<td>Tie strength x Utility of network connect</td>
<td>6,8%</td>
</tr>
<tr>
<td>Diversity of information</td>
<td>21%</td>
</tr>
<tr>
<td>Relevance of information</td>
<td>20%</td>
</tr>
<tr>
<td>Unit proximity department</td>
<td>0%</td>
</tr>
<tr>
<td>Unit proximity plant</td>
<td>0%</td>
</tr>
<tr>
<td>Tenure difference</td>
<td>0%</td>
</tr>
<tr>
<td>Gender homophily</td>
<td>0%</td>
</tr>
</tbody>
</table>

Table 2: Missing values
Sequential regression was used to test the hypotheses. First the diversity of information was regressed on the control variables. Secondly diversity of information was regressed on the control variables and tie strength. ‘Moderator effects are indicated by the significant effect of $XZ$ while $X$ and $Z$ are controlled’ (Baron & Kenny, 1986, p.1176). Before multiplication of the independent continuous variables they were centered since it would deliver statistical and interpretive advantages (Keith, 2006). A prime reason for centering is reduction in multicollinearity (Keith, 2006). This was accomplished by subtracting the mean score of the variable from each person’s score on that variable (using a compute statement in SPSS), resulting in a new variable with a mean of zero and a standard deviation equal to the original standard deviation (Keith, 2006).

To test moderation, the control variables, tie strength, utility of network connection and the interaction between these two variables were included in the third model. The same steps were taken for the relevance of information. R square was computed for each model showing what proportion of variance in the dependent variable was significantly explained by the variables (Pallant, 2007). Moreover it was checked if R square increased statistically significantly while entering more variables. The betas of the independent variables were used to see what effect the independent variables have on the dependent variable and the significance levels indicated whether these effects were significant (Keith, 2006).

4. Results

First of all, table 2 provides the correlations among all the variables, means and standard deviations. There are no correlations among the control variables and between the control variables and the dependent variables. For the diversity of information there are low correlations with the independent variables. However for the relevance of information the independent variables are acceptably correlated. The dependent variables diversity of information and relevance of information are negatively correlated, which indicates that they are conceptually different. The correlation among the independent variables tie strength and utility of network connection is fairly large (0,62), but well within acceptable limits for joint inclusion in a regression model (Nunnally, 1978). The concept of tie strength is relational and utility of network connection is work-related. Pallant (2007) says ‘that multicollinearity exists when the independent variables are highly correlated (r.=.9 and above)’ (Pallant, 2007, p.149). She further argues that you should check that the correlation between each of the independent variables is not too high and she advises against including variables with a bivariate correlation of 0.7 or more in the analysis. This study conforms to these criteria.
4.1 Regression results

As mentioned in the previous section, this study used sequential regression for the two dependent variables: diversity of information and relevance of information. Three models were executed to test the hypotheses and each model will be discussed for the diversity of information and relevance of information. After each model R square significantly increased when additional variables were entered in the models. Table 3a gives the regression results for the diversity of information. The coefficients presented in the tables are standardized regression coefficients. The second model for both regressions displays the effect for the independent variable tie strength on the dependent variables diversity of information (table 3a) and relevance of information (table 3b), when controlling for gender homophily, tenure difference, unit proximity department and for unit proximity plant. Tie strength has a negative and significant effect on the diversity of information (p < 0.001).

Table 3: Regression results

Table 3a: Predicting diversity of information: regression results

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<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender homophily</td>
<td>0.46***</td>
<td>0.27***</td>
<td>0.17***</td>
</tr>
<tr>
<td>Tenure difference</td>
<td>0.07***</td>
<td>0.06***</td>
<td>0.08***</td>
</tr>
<tr>
<td>Unit proximity plant</td>
<td>0.34***</td>
<td>0.08**</td>
<td>0.00</td>
</tr>
<tr>
<td>Unit proximity department</td>
<td>0.07***</td>
<td>-0.08***</td>
<td>-0.03*</td>
</tr>
<tr>
<td>Tie strength</td>
<td></td>
<td>0.58***</td>
<td>-0.22***</td>
</tr>
<tr>
<td>Utility of network connection</td>
<td></td>
<td></td>
<td>0.94***</td>
</tr>
<tr>
<td>Tie strength x Utility of network connection</td>
<td></td>
<td>0.07**</td>
<td></td>
</tr>
<tr>
<td>R squared</td>
<td>0.64***</td>
<td>0.69***</td>
<td>0.77***</td>
</tr>
</tbody>
</table>

Results are standardized regression coefficients.
†= p < 0.10, *= p < 0.05, **= p < 0.01, ***= p < 0.001

Table 3b: Predicting relevant information: regression results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender homophily</td>
<td>0.42***</td>
<td>0.17***</td>
<td>0.06**</td>
</tr>
<tr>
<td>Tenure difference</td>
<td>0.11***</td>
<td>0.09***</td>
<td>0.11***</td>
</tr>
<tr>
<td>Unit proximity plant</td>
<td>0.34***</td>
<td>0.00</td>
<td>-0.07***</td>
</tr>
<tr>
<td>Unit proximity department</td>
<td>0.13***</td>
<td>-0.08***</td>
<td>-0.02†</td>
</tr>
<tr>
<td>Tie strength</td>
<td></td>
<td>0.77***</td>
<td>-0.11**</td>
</tr>
<tr>
<td>Utility of network connection</td>
<td></td>
<td></td>
<td>1.02***</td>
</tr>
<tr>
<td>Tie strength x Utility of network connection</td>
<td></td>
<td>0.05**</td>
<td></td>
</tr>
<tr>
<td>R squared</td>
<td>0.66***</td>
<td>0.75***</td>
<td>0.84***</td>
</tr>
</tbody>
</table>

Results are standardized regression coefficients.
†= p < 0.10, *= p < 0.05, **= p < 0.01, ***= p < 0.001
Table 2: Means, Standard Deviations, and Correlations among Variables (N = 186 - 235)

<table>
<thead>
<tr>
<th>Variables</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gender homophily</td>
<td>0.85</td>
<td>0.36</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Tenure difference</td>
<td>-4.89</td>
<td>80.64</td>
<td>-0.03</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3. Unit proximity plant</td>
<td>1</td>
<td>0.45</td>
<td>-0.08</td>
<td>-0.00</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Unit proximity department</td>
<td>0.42</td>
<td>0.49</td>
<td>-0.13</td>
<td>0.02</td>
<td>-0.07</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Tie strength</td>
<td>4.78</td>
<td>1.35</td>
<td>-0.1</td>
<td>0.1</td>
<td>0.12</td>
<td>0.44**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Utility of network connection</td>
<td>3.92</td>
<td>0.77</td>
<td>-0.1</td>
<td>0.07</td>
<td>0.00</td>
<td>0.20**</td>
<td>0.62**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Tie strength x utility of</td>
<td>0.65</td>
<td>1.18</td>
<td>-0.07</td>
<td>-0.02</td>
<td>0.08</td>
<td>0.06</td>
<td>-0.21**</td>
<td>-0.37**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>network connection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Diversity of information</td>
<td>4</td>
<td>1.27</td>
<td>0.06</td>
<td>-0.03</td>
<td>-0.03</td>
<td>-0.1</td>
<td>-0.05</td>
<td>0.1</td>
<td>-0.17*</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9. Relevant information</td>
<td>5.36</td>
<td>1.56</td>
<td>-0.01</td>
<td>0.14</td>
<td>-0.05</td>
<td>0.07</td>
<td>0.35**</td>
<td>0.63**</td>
<td>-0.21**</td>
<td>-0.1</td>
<td>1</td>
</tr>
</tbody>
</table>

*= p < 0.05, **= p < 0.01
This empirical evidence fully confirms Hypothesis 1, tie strength has a significant negative effect on the diversity of information. Hypothesis 2 is rejected: tie strength has a negative and significant effect (p < 0.01) on the relevance of information instead of a positive effect. The magnitude of the effect for tie strength is stronger for the diversity of information than for the relevance of information (-0.22 and –0.11 respectively).

Hypothesis 3 and 4 are shown in model 3 in table 3a and 3b. Hypothesis 3 is supported by the results (p < 0.01). Utility of network connection moderates the negative relationship between tie strength and diversity of information positively. The plot in figure 1a shows an ordinal interaction, which means that the simple regression lines for an interaction do not cross within the possible range of values of the other variable and are not parallel to each other (Aiken & West, 1991). The plot shows that utility of network connection will increase the diversity of information when ties are weak and strong.

Model 3 in table 3b indicates that the higher the utility of network connection, the higher the negative and significant effect of tie strength on the relevance of information which partly confirms Hypothesis 3b (p < 0.01). Here also a positive instead of a negative effect was hypothesized on the relevance of information, but the utility of network connection did increase the effect of tie strength on the relevance of information. The plot in figure 1b shows an ordinal interaction effect and the effect of utility of network connection is clearly present for weak and strong ties. However it should be noted that the interaction effect of the utility of network connections is rather small.

Figure 1: Interaction plots between tie strength, the utility of network connection and diversity and relevance of information.
Figure 1a: Ordinal interaction effect on diversity of information.
Figure 1b: Ordinal interaction effect on relevant information.

Model 3 in both tables 3a and 3b shows that tie strength and utility of network connection have a small interaction effect on the diversity of information and on the relevance of information. However tie strength and the utility of network connection also individually influence the diversity of information and the relevance of information. The effect of tie strength on the dependent variables is negative and the effect of the utility of network connection on the dependent variables is positive, indicating that they are different concepts. Furthermore the individual effects of tie strength and the utility of network connection are larger than the interaction effect. The direct effect of utility of network connection is even large.

4.2 Control variables

Gender homophily indicates in all models, and for both diversity of information and for the relevance of information that the respondents have a tendency to interact more with the same gender. However only 13% of the respondents was female, so there is a far lower chance for interacting with females instead of males. Tenure difference was significant and positive in all models for both diversity of information and for the relevance of information. This indicates that respondents have a tendency to go to employees with a higher tenure than them for relevant and diverse information. For the diversity of information unit proximity (plant) is positive and significant in model 1 and 2 and becomes non significant in model 3, so individuals will stick to their own plant to acquire diverse information in model 1 and 2. However the magnitude of the effect decreases when more variables are entered in the multiple regression.

Unit proximity (plant), predicting the relevance of information is positive and significant in model 1, has no significant effect in model 2 and it turns negative and significant in model 3. This indicates that respondents will interact more with employees with the same plant in model 1 and 2. However the magnitude of the effect decreases when more variables are entered in the multiple regression.
model 3. In model 1 individuals prefer to interact with individuals of the same plant and in model 3 it is the other way around.

The final control variable is unit proximity (department). In model 1 the effect of this variable is positive and significant (p< 0.001), consequently individuals will acquire more diverse information from people from their own department. However when in model 2 and 3 the independent variables tie strength and utility of network connection are added the effect is negative and significant (p< 0.001; p< 0.05)). Hence in these models the respondents would obtain diverse information from people from other departments. Interestingly these results are the same for the relevance of information, however the level of significance is different in model 3 (p< 0.10).

5. Conclusion
This study sought to contribute to the debate on the effects of tie strength on the diversity of information and on the relevance of information by explicitly separating the dependent variables and by hypothesizing different effects of tie strength on these variables. Moreover this study responded to the notion that individual characteristics have been disregarded in social network research (Kilduff & Brass, 2010) by arguing that the utility of network connection would moderate the effect of tie strength on the diversity and relevance of information. Moreover this study succeeded in contributing to the literature on these topics.

First of all, this study clearly demonstrates the importance of weak ties for obtaining diverse and relevant information. Contrary to the expectation, weak ties also resulted in relevant information.

Furthermore the utility of network connection, ‘the belief that social networks provide the opportunities and constraints that affect outcomes of importance to individuals and groups’ (Kilduff & Brass, 2010, p.319) measured by the extent to which actor i believes to know the expertise of j, perceives j’s knowledge to be valuable and accessible, proved to influence the acquisition of diverse and relevant information while interacting with tie strength. However the interaction effect of this was rather small. So indeed the mere fact of a tie does not guarantee the materialization of social capital effects (Adler & Kwon, 2002) and individual perception is constitutive for action (Kilduff & Brass, 2010).

The plots clearly showed that a higher utility of a network connection results in more diverse and relevant information when it interacts with tie strength. So it can be concluded that weak ties will result in more diverse and relevant information and the higher the utility of network connection and the lower the tie strength, the higher the effects on the diversity of
information and on the relevance of information. Contrary to the expectation weak ties resulted in relevant information as well. This will be discussed in the discussion. Although the direct effect of the utility of network connection was not hypothesized in this study, the results show that this variable has a large effect on the diversity of information and on the relevance of information.

There are some other interesting findings. Comparing tenure difference for the diversity of information and relevant information for all models, actors have a preference for people working longer than them in the organization for diverse and relevant information (p< 0,001). It should be noted that the coefficient for tenure difference are small.

In this study individuals receive more diverse information from connections with other departments than their own. This makes sense because meetings and interviews indicated that the departments are highly interdependent. Only in model 2 it showed that actors receive more diverse information from connections in their own plant than their connections with actors in another plant. Furthermore they obtain more relevant information from connections from actors of other departments and from connections with actors from the other plants. This seems strange, however while operationalizing unit proximity plant it was found out that a large part of the sample was responsible for both plants. So all in all it seems that the departments are highly dependent on the input of other departments to do their work and this count for obtaining relevant and diverse information.

6. Discussion and reflection

6.1 Discussion
Contrary to the expectation, weak ties resulted in diverse and relevant information in all regressions. However this corresponds to findings in earlier research (Anderson, 2008; Granovetter, 1973; Hansen, 1999; Nelson, 1989). So considering the results of this study Anderson (2008) was right when he stated that weak ties will lead to more relevant information. Weak ties are expected to be related to a larger network size, both because weak ties are less costly to maintain (Hansen, 199) and because an actor’s weak ties are less likely to know one another (Anderson, 2008). In addition a greater number of ties make it more likely that an actor will have relevant information (Anderson, 2008). McEvily and Zaheer (1999) argued that weak ties who yield less redundancy than strong ties would be faster and more efficient in information gathering, resulting in a similar amount of information that is of higher quality and more useful. Weak ties are important for solutions, presumably because they bridged into sub networks containing non redundant information (e.g., Cross & Sproul, 2004; Granovetter
This corresponds to relevant information in this study because it was defined as being relevant for the work assignment or problem and reflected the definition of actionable knowledge.

Another possible explanation for this contradicting finding is that strong ties constrain action more than weak ties (Hansen, 1999), limiting the possibility for finding relevant information. Weak ties are less constraining compared to strong ties, because they are less likely to be reciprocal and there is less immersion compared to strong ties (Hansen, 1999). Therefore when using weak ties, actors do not have to provide high levels of help to others in turn which fastens the completion of their own tasks instead of spending time to helping others which is more essential in strong ties (Hansen, 1999). Nahapiet and Ghoshal (1998) also stated that social relations, often established for other purposes, constitute information channels that reduce the amount of time and investment required to gather information (p.252). In addition they can spend more time to gathering relevant information. Furthermore actors come to rely on established communication channels in which they are strongly immersed (strong ties) and because of that these actor are less likely than weak ties to search for knowledge outside their existing contacts (Hansen, 1999), which limits the possibility of finding relevant information.

The utility of network connection had a small interaction effect with tie strength on diverse and relevant information. Therefore more attention should be paid to individual cognition, since it affects social network properties and it is not just about actors, ties and structures, but about cognition of these actors as well. Furthermore the utility of network connection had a large direct effect on the dependent variables. So the more an actor thinks to know the other actor’s expertise, the value and accessibility of that expertise the more that relationship would be used to obtain diverse and relevant information. Since the direct effect of the utility of network connection was large and even larger than the effect of tie strength, more research should focus on this variable.

Actors acquire more diverse and relevant information from people working longer than them in the organization than actors working shorter than them in the organization. So the arguments of Borgatti & Cross (2003) hold for diverse and relevant information, when they state that ‘newer members should know less and, therefore, are less likely to be sought for information’ (p.438). New employees need first to go through organizational socialization which is the process by which an individual acquires the attitudes, behavior, and knowledge she or he needs to participate as an organization member (Morrison, 2002, p.1149) and are therefore less used to obtain information.
However the difference in tenure was small. This could be due to the fact that employees will seek communication with employees whose organizational language skills are at least as extensive as their own seek and because of that communicate with others whose tenures’ in an organization are at least as great as their own (Zenger & Lawrence, 1989).

6.1.1 Recommendations for future research

The empirical evidence of this research has important implications for social network research and for managerial practice. This study suggests for a revision of the assumptions of the effects of tie strength on diverse and relevant information. Especially the assumptions concerning strong ties should be closely examined, since this study has strong evidence against the information benefits due to the effects of strong ties. This research showed that weak ties are more effective in generating diverse and relevant information than strong ties.

In this research the hypothesis that weak ties will lead to diverse information was supported. However in innovation research there are contradicting views on the effect of tie strength on the diversity of information. In this field of research the strength of strong ties is also claimed for diverse or novel information (Capaldo, 2007; Gilsing & Nooteboom, 2004). For example Capaldo (2007) stated that strong ties can ‘offer steady flows of new ideas, technological innovations, and operational support’ (p.587). Moreover he added that investments in strong ties demonstrates mutual commitment which further reinforces the development of social contents, reciprocity, foundations for future interactions, deepened mutual knowledge and this has a positive effect on value creation in the relationship (Capaldo, 2007). This difference in the effects of tie strength on the diversity of information could lie in the difference between the context of this study and the innovation context. Probably strong ties are needed for innovation, because a lot of trust is needed in developing innovation which should diminish the possibility of unwanted knowledge spillover and the possibility that an organization would introduce innovations at a faster rate than the organization in which the innovation started (Breschi & Lissoni, 2001). However this inconsistency should be investigated in future research.

As is also the case in this research, a lot of research in social network research concerning the theory on weak ties and diverse or novel information leans on the initial reasoning of Granovetter (1973) that weak ties will have more redundant contacts and therefore would result in more diverse and relevant information. However he did not provide a clear measure for these dependent variables. Furthermore some authors copied his reasoning without testing it (e.g. Nelson, 1989). In addition several studies report that social network researchers some-
times indirectly measure the outcomes of social network structure (Anderson, 2008; Hansen, 1999: Rindfleish & Moorman, 2001). For example whether weak ties lead to diverse information is often measured by measuring the number of non redundant contacts (e.g. Hansen, 1999). This study recommends future research to directly measure the outcomes of characteristics of social network structure, in order to increase the reliability and validity of the results.

Further research should definitely include individual characteristics like individual perception in studying the effects of social network structure, since this study proved that individual perceptions of ties influence the receipt of relevant and diverse information. Although the interaction effect was small, the direct effect was large. The extent to which actors think to know the other’s expertise, the value and accessibility of that expertise for their work, the more information benefits they will have. It would be very interesting if future research would focus more on the effects of individual perception combined with social network structure.

6.1.2 Recommendations for managerial practice

The current study has a clear message for managerial practice. Based on the empirical evidence it is recommended to invest in the relationships among employees. It should be tried to increase the amount of weak ties in an organization because that will result in an increased individual collection of relevant and diverse information on work related topics which could be applied to increase the individual and consequently the organizational performance.

One way of stimulating the formation of weak ties is by stimulate networking in organizations, so that individuals, who barely see each other, could meet and by meeting new people weak ties could be developed. Garcia-Lorenzo (2006) argues that organizations that develop networking practices internal to their organization are more able to effectively deal with knowledge. Networking practices are ‘enablers in allowing people to share and develop new ways of working, relating, and sharing without having to go through very standardized/explicit organizational arrangements to do so’(Garcia-Lorenzo, 2006, p.188-189). She further argues that connections established among different members stimulates information transmission among collectives and also opens up possibilities for generating and sharing new meanings, which in turn provides increased capability to innovate as well as to share and generate knowledge.

Furthermore organizations could ‘view their organizations as consisting of a network of multiple communities with specialist expertise, denoted as communities of knowing ,
communities of practice, communities of practitioners and micro communities of knowledge’ (Hustad, 2004, p. 59). In these communities it is common that the members share information, insight, experience and tools about an area of common interest (Hustad, 2004). Furthermore he argues that this context is not limited to a physical space like face-to-face meetings, but also includes virtual and mental spaces. In these spaces organizational actors could join when they need particular information or to assist others who need particular information, thereby stimulating the formation of new weak ties.

In addition interventions like project teams (Fong, 2003), flexible workspaces (Robertson, Huang, O’Neill & Schleifer, 2008) and job rotation (Campion, Cheraskin & Stevens, 1994) could also stimulate the formation of weak ties, because it is inherent in these concepts that individuals over different particular periods of time physically switch in the organization, thereby reducing the probability of developing strong ties for which frequent interaction and a close relationship are needed (Hansen, 199) and so stimulating the development of weak ties.

The above suggestion for organizations could also increase the extent in which the actors in an organization think to know their colleagues’ expertise, value of that expertise and their accessibility. Moreover organizations should invest in making the utility of the connections in the organizational network as high as possible and should stimulate the employees to use their connections to improve their and others performance. Organizations should invest more in informal meetings between the employees. ‘Interventions, structural and otherwise, doubtless influence tie strength and configuration in organizations’ (Nelson, 1989, p. 398). By more frequent interaction outside the duties of their work actors could acquire a better understanding of their colleagues’ expertise, value and accessibility which then could increase the use of their ties and the collection of diverse and relevant information. Organizations should make the expertise of their employees known to their employees in for example a database, so that individuals easily can find the expertise they need. Moreover more attention should be paid to the kind of knowledge that is valued by the employees and the organizations should stimulate the accessibility of the employees. This could be done by for example installing an open-door-policy and by locating interdependent actors/departments close to each other. Because what people think is constitutive for action, organizations should invest in providing their employees with the information that is in the organization and which they need or could need in the future to perform in their tasks at the organization.
6.2 **Limitations**

This research also has limitations. First of all, this research is executed in one chemical organization in which the departments are highly interdependent. Moreover a large part of the organization are males. These characteristics are rather specific and are probably not generalizable to all organizations. So it is likely that ‘different national, occupational, or organizational cultures would provide different patterns as to the importance of any given social relationship’ (Cross et al. 2001, p.445).

Secondly the primary focus of this study is on social relationships as sources of information. This study did not address the way in which the information benefits result from social relationships. Probably actors can receive information through face to face contact, by email, through online forums etcetera and their effectiveness could differ. So the medium through which the information is obtained could be investigated in future research.

Thirdly, the dependent variables are measured with one item, which could cause problems according to Bryman (2008). Possible issues with using one item are that a single question could incorrectly classify many individuals due to the wording of the question or misunderstanding of the question.

6.3 **Reflection**

It was very hard to find an organisation for this research. After a lot of effort one organization was found to participate, but because of the search difficulties the data collection could start later than preferred. Due to interpretation issues with the items in the organization one item was chosen which is also what Anderson (2008) did although he did not provide an argument. There were also some issues with the length of the questionnaire. The organization found the first draft of the questionnaire too long and complex because for most questions the respondents needed to fill in the question for a part of thirteen employees from which they acquired information in the past three months in a matrix format. Therefore 1 item instead of three items was used and as a consequence the amount of matrices and possibly respondent fatigue (Anderson, 2008) were lowered. In addition there was some resistance from the organization for the fact that the names of the possible ties were displayed in the questionnaire. In this discussion it was made clear that codes would be attached to the names of the respondents to which only the researcher had access. However this issue somewhat delayed the research process. Furthermore the links to the online surveys were e-mailed to each respondent independently. Other challenges in the research process were the construction of online questionnaires, the use of the software program Ucinet and the use of MRQAP, because the researcher had no experience with these tasks and programs beforehand.
All in all doing this research and writing this thesis was definitely a valuable experience and has contributed to my professional and personal development.

7. References


