# How Social is Your Social Network? Toward A Measurement Model

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*Short Paper*

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## Abstract

*Social networks are omnipresent in both our private and professional lives. As social beings, we thrive on the ability provided to us by the technology to be social. But what does it really mean to be social within social networks? To better capture and measure socialness in that context, we look beyond measures of being active and having many connections with others, like Social Network Analysis does. In this paper, we zoom in on a new dimension that captures the content of social exchanges. We propose, that social(ness) markers related to content can be divided into four facets: being personal, being curious, being respectful, and share with others. A correlation analysis is applied to showcase how each facet is related to the dimensions of activity and connectivity. As a result, we provide a comprehensive measurement model for socialness in computer-mediated and networked environments.*

**Keywords:** enterprise social networks; social network analysis; socialness

## Introduction

Since the dawn of mankind, humans have sought relationships with others. Forming social networks based on some type of interdependency, like friendships or common professional interests (Wasserman and Faust 1994), is commonplace. What is new is that those networks are computer-mediated. Digital social networks, such as Facebook, defined as *"web-based services that allow individuals to construct a public or semi-public profile within a bounded system, articulate a list of other users with whom they share a connection, and view and traverse their list of connections and those made by others within the system"* (Boyd and Ellison, 2007, p. 211) are omnipresent. Today, more than 2.5 billion people are part of such social networks (Statista 2019). Within the last decade, the concept has also diffused into organizations in the form of "enterprise social networks" like IBM's Connections or Microsoft's Yammer (Leidner et al. 2018; Meske et al. 2019a). Against this backdrop, it may seem paradoxical to wonder about "how social" these networks truly are. After all, social networks are predominantly designed to facilitate social exchanges with friends all around the world and, in the case of enterprise social media, with colleagues from across the organization (Riemer et al. 2015; Meske et al. 2019b). However, so we argue, just because social networks have been designed for "being social" does not mean that they are indeed reflective of social behavior.

IS researchers have used a variety of measures to understand and capture the intricacies of social networks, predominantly that of social network analysis, or SNA in short, that focuses on quantifiable aspects of the network structure (Howison et al. 2011). For example, some have investigated aspects of user activity (e.g., as part of IS diffusion studies); others have looked at feelings expressed in language (e.g., as part of studies on sentiments in social networks) (e.g., Stieglitz and Dang-Xuan 2013). What is missing is the social component, representing a complex theoretical construct, which requires, so we argue, a combination of dimensions, including: content, activity and connectivity.

In this paper, we argue that "socialness," or the urge of an individual to be social, is a characteristic that can be found in social networks, but one that has been insufficiently measured. Thus, we conceptually develop four facets that make up its theoretical foundation. In this paper, being social in a social network means (1) being personal, (2) being curious, (3) being respectful and (4) sharing with others. Utilizing this conceptualization, we further develop a measurement that extends and complements existing quantitative measures of social network analysis. Applying our newly formed measurement to networks of two different companies with more than 3,000 users over a period of 24 months, we will showcase the measurement's theoretical and construct validity.

Doing what we do is important for multiple reasons. *First*, posting messages, and with it choosing a writing style, is not only an essential way for a human to express himself/herself in general but increasingly important in an online environment. With the number of computer-mediated communication channels increasing, often substituting for "real" communications, understanding how and to what extent the written word is reflective, and expressive, of social behavior is important. In this paper, we conceptually clarify the notion of "being social" in an online world. *Second*, methodologically we showcase how the existing social network analysis (SNA) underestimates the standing that an individual has within his/her network when the conceptual idea of "being social" is ignored. For example, we will argue that looking at activity (e.g., how often or how many messages are sent) and connectivity levels (e.g., with whom are individuals connected?) is insufficient as we are missing out on the "social content" of these interchanges. By adding a third component to existing SNA tools, we will be able to demonstrate the power of our revised conceptual understanding of "being social." And *third*, we bring together a conceptual frontend with a methodological backend and form a coherent unit that future researchers can use—not only for social networks in particular, but for online communities in general.

## Relevant Literature and Conceptual Background

Socialness, or seeking the community of others, is part of our biological makeup. According to the German sociologist Simmel, being social is an innate urge of the human being. While soliciting social interactions and forming ties with others is desirable, it is not necessarily a goal-oriented one—often, it has no other purpose than the act itself (Simmel and Hughes 1949). Forming friendships, achieving personal recognition among a network of friends and peers, or receiving a feeling of support, all stem from our urge of socialness (Berry 1995).

Whiles studies have looked at sociability, or the ability of technology to appease our urge for socialness (e.g., Preece 2000; Junglas et al. 2013), they remain vague about how much of "being social" transpires from the real world into the digital world when, for example, messaging is involved. The majority of studies has either relied on manipulating sociability (e.g., low versus high) or applied subjective methods, such as surveys that are often cross-sectional in nature, and thus are unable to track the phenomenon over prolonged periods of time. Social network analysis (SNA), on the other hand and seemingly a natural match for measuring "socialness" in a networked setting (Howison et al. 2011), captures mostly quantifiable aspects about the structure of the network and fails to look at the contents of a social interaction. In consequence, these studies ignore the meaning of what is being said.

Studies at the intersection of social psychology, communication, linguistics, and social sciences, in contrast, have shown that language is a social practice, and that the language we choose to express ourselves serves as a route to the inner workings of our mind (Wood and Kroger 2000). Thus, conversations carry important markers of social behaviors and are therefore symptomatic of socialness (e.g., Golbec et al. 2011). Accordingly, we claim that "socialness" as a construct can be inferred from social(ness) markers embedded in the language of a computer-mediated conversation. More specifically, socialness comprises: (a) that the conversation between individuals is about something *personal* that relates to both parties in some sense, (b) that the participating individuals are *curious* about their respective communication partner, (c) that the conversation is carried out in a *respectful* manner, exhibits a certain level of decorum, and is positive overall, and (d) that individuals are willing to *share* stories, insights and experiences with others as part of the conversation.

**Being social means being personal:** Being personal in a conversation means that an individual is socially aware of the other individual or group of individuals for that matter, and that he or she is able to relate to the other person (Norrick 1994). Research has shown that the gradual exploration of another person occurs along two dimensions: breadth and depth (Hornstein and Truesdell 1988). Conversational breadth refers to the number of topical areas that an individual talks about during an encounter; conversational depth, on the other hand, refers to the level of intimacy with which a specific topical area is discussed (Hornstein and Truesdell 1988). The gradual exploration of another person typically starts with one area, and moves from superficial to intimate, before the conversation spreads in breath (e.g., Morton and Douglas 1981). Being personal is therefore reflected in the extent to which a message is tailored to the relationship (Knobloch and Solomon 2003) and shows a good balance between stories about oneself or oneself as part of the group and others.

**Being social means being curious:** Being curious in a conversation means being inquisitive and asking questions about the other individual. This not only prompts an action-reaction type of sequence to keep a conversation afloat, but also means that as part of a reply to the very same question, more information enters the realm of conversation. This, in turn, lays the foundation for the range of questions to broaden, and the conversation to continue on. Curious also means caring, and being concerned about the other person's well-being (Fredriksson and Eriksson 2003). Conversationally, being curious means addressing the other person a lot. Being curious is therefore reflected in the extent to which an individual asks questions about the other person, as well as how he/she addresses others in their choice of words.

**Being social means being respectful:** Being respectful in a conversation means being polite, among other things, by using the right cues to keep the conversation on a positive track and not developing animosity or upsetting the conversational counterpart (Danescu-Niculescu-Mizil et al. 2013). As Grandin and Barron (2005) aptly state: "it's an unwritten rule of our social culture that being polite and having good manners gains you entry into group social interactions, whether that interaction is personal or professional, between two people or among many individuals" (p. 214). Being respectful also includes aspects of optimism with the objective to make the conversational counterpart feel good about herself/himself (Brown and Levinson 1987). Being respectful might therefore be reflected in the extent to which an individual uses polite word expressions, as well as positive sentiments in his/her language.

**Being social means sharing:** Sharing is considered a prosocial act, as described by e.g. Bucher et al. (2016) that not only instigates bonding experiences between individuals, but also fosters existing ones. Sharing can be viewed analogous to the idea of "gift giving", a processual chain of reciprocities (Sherry 1983), where an individual is motivated to spend time and effort on selecting a gift that is specific to the recipient. In an online conversation, sharing goes beyond the exchange of just words—it makes use of the digital form of gift-giving, for example, through sharing a link or a document that is relevant to the content

of a conversation. By sharing online individuals are said to build relationality, i.e., life experiences with others (Baker et al. 2005).

## Linking Concept and Measurement

Advancing the idea of what constitutes "being social" in a computer-mediated and networked environment, and the extent to which this very environment is able to facilitate this urge requires both: a conceptual anchoring as well as a methodological measurement. Both have to form a harmonious union so that concept and measurement "fit" one another. Only then is construct validity ensured. Our ambition for this paper is exactly that: proposing a harmonious "fit" between markers that constitute a "social" conversation on one hand, and measuring the extent to which those markers are present. In that sense, our approach mimics what "discourse analysis" tries to do. Discourse analysis "has an analytic commitment to studying discourse as texts and talk in social practices" (Wood and Kroger 2000, p. 3). As Fairclough (1992) put it: "One cannot properly analyse content without simultaneously analysing form, because contents are always necessarily realised in forms, and different contents entail different forms and vice versa" (Fairclough 1992, p. 194).

On the measurement side, researchers have developed, and often used, social network analysis (SNA). In the following, we will demonstrate that SNA on its own is insufficient to tap into the meaning of being social and should be expanded.

### Analyzing the Social Network

Social network analysis (SNA) relies on the mathematical structure of a graph, often captured as a mathematical matrix, to capture actors, or nodes, and their relationships, or links. In the IS realm, SNA has been used extensively as a method (e.g., Kilduff and Brass 2010; Burt et al. 2013; Tasselli et al. 2015). Researchers have used SNA to answer questions about how and why individuals contribute to, share and collaborate in online communities (e.g., Shi et al. 2014; Khansa et al. 2015; Faraj et al. 2015), how information diffuses in those communities (Stieglitz and Dang-Xuan 2013), how groups sustain and stay alive (Ridings and Wasko 2010) and how trust is formed (Bapna et al. 2017). For that, IS researchers have looked at a broad range of networks, including Yahoo!Answers (Khansa et al. 2015), Twitter (Stieglitz and Dang-Xuan 2013; Shi et al. 2014) and Facebook (Bapna et al 2017). The SNA applied in these studies mainly relied on two quantitative dimensions, including the activity that a node, or user, exudes, as well as the degree to which that user is connected with others in the network.

For *activity* levels, for example, studies have looked at the frequency of posting weekly questions and weekly answers, and used SNA to demonstrate that both variables were mostly driven by the level of membership and tenure, past behaviors, and incentives, including badges or ratings (Khansa et al. 2015). Activity levels, or the frequency and amount with which individuals contribute to a group or network is an important aspect of socialness (e.g., Nie 2001). An individual that is posting a lot of messages is typically considered a social person. For *connectivity* levels, for example, studies have shown that connectivity in social setting is strongly related to the relationships between people, and to what extent they are connected with each other and that online participation can be explained by the users' structural positions in the network (Shi et al. 2014). Connectivity is typically assessed by computing for example a user's position in the network (e.g., eigenvector centrality, closeness centrality), his/her status as binding sub-groups of the network together (e.g., betweenness centrality), or his/her number of communication partners (e.g., degree centrality).

The third component, that we are suggesting in this paper, apart from activity and connectivity, is that of *content*. Looking at the contents of social interactions, and by doing so, trying to understand the meaning of what is being said as part of the social interaction, we claim is essential to a more comprehensive form of SNA. Some of the few studies that have suggested this third component have done so by looking at the concept of communicative genres to structure and better understand online communities (Moser et al. 2013). They were able to cluster users as team players (short and advising messages), storytellers (long and socializing-oriented messages), utility posters (share knowledge but do not socialize) as well as all-round talents (average in all described message characteristics) (Moser et al. 2013). Yet another study has investigated the antecedents of being seen as a leader in online communities. It was found that for example thanking others, sharing technical expertise, and an individual's structural social capital (e.g., betweenness centrality) were the main drivers for leadership in digital networks (Faraj et al. 2015).

## A Comprehensive Measurement Model

Adding a third dimension to better capture and measure socialness in a computer-mediated and networked environment requires to look beyond activity and connectivity, and to zoom in on the form and content that an individual produces and that is representative of her social behavior. In order to capture the social content markers, we extract and derive multiple metrics using a dictionary-based text analysis approach that counts relative frequencies. Similar dictionary-based text analysis methods have been widely used by researchers in other multidisciplinary fields (Tausczik and Pennebaker 2010). Table 1 provides an overview of all measurements and their relation to our four facets of socialness (as introduced earlier).

**Table 1. Content Measurements**

| Facet | Measure | Semantic Expression | Word List |
|---|---|---|---|
| Being personal | Individualism | Fraction of 1st person singular pronouns | 22 words, e.g., "I, I'm, I've, me, my" |
| | Collectivism | Fraction of 1st person plural pronouns | 12 words, e.g., "we, we've, let's, us, ours" |
| Being curious | Asking questions | Fraction of messages that contain at least one question mark | |
| | Addressing other person directly | Fraction of 2nd person singular and plural pronouns | 24 words, e.g., "you, you'd, you've, your, yourself" |
| Being polite | Sentiment | Difference between positive and negative words, divided by total number of words | 6779 words, e.g., "great, happy, awesome, issue, problem" |
| | Politeness | Fraction of polite words | 25 words, e.g., "please, thanks, thx, sorry, appreciate" |
| Sharing | Reference sharing | Fraction of messages that contain at least one URL reference | |
| | Document sharing | Fraction of messages that contain at least one attachment | |

Being personal is captured by the usage of personal pronouns. Personal pronouns can be considered as language markers of social relationships and interactions (Kacewicz et al. 2014). Since they refer to human beings and function as a reference between the speaker and listener, they highlight, for example, whether the focus of attention is on self as a distinct entity (I, me, mine), or as part of a specific group (we, us, ours) (Chung and Pennebaker 2007). In order to measure "*being personal*" we relied on measures of individualism and collectivism (e.g., Twenge et al. 2013; Chung and Pennebaker 2014). The word lists for individualism and collectivism were extracted from the LIWC2015 personal pronouns categories (Pennebaker et al. 2015).

*Being curious* is captured by the extent to which an individual asks questions—as the act of asking indicates curiosity and furthers the progression of conversation between people. More specifically, being curious is captured by indicating the proportion of messages that included at least one question mark (Gifford and Hine 1994), as well as by the extent to which an individual is addressed directly (Pennebaker et al. 2003). The latter is measured by the usage of second person pronouns, suggesting that the focus of conversation is directly on the other person.

*Being polite* is expressed by measures of politeness (Grandin and Barron 2005; Danescu-Niculescu-Mizil et al. 2013) and word sentiments (Hu and Liu 2004). Politeness is measured by the usage of words that have a polite connotation, and sentiment is calculated based on words with positive or negative connotations. For the latter, and more specifically, we computed the difference between positive and negative sentiment scores and divided it by the total number of words authored by an individual.

*Sharing* is captured as an individual's tendency to share documents and references. More precisely, we compute the proportion of messages that contained URLs in relation to all messages an individual authored, as well as the proportion of messages that included an attachment in relation to all messages an individual authored.

Apart from content measures, we will also apply traditional measures of SNA, including that of activity and connectivity. In terms of activity, for example, we measure the frequency of activities (Correa et al. 2010) using the rate of sent messages within a certain time frame. Using a rate, i.e., messages per time, rather than absolute counts allows us to compare individuals that did not join the network at the same time. In terms of connectivity, we compute the absolute degree centrality that corresponds to the number of different direct communication partners (Scott 1988). We consider this measure more appropriate than other network measures, as our study aims to capture an individual's tendency to communicate with many different partners. According to our conceptual understanding, a person with more connections should be seen as more social and more open to talk with different people—as opposed to someone who just seeks the company of a single user (e.g., his/her spouse or best friend).

## Setting and Data

In recent years, companies have increasingly been implementing Enterprise Social Network (ESN) solutions to enhance collaboration, innovation and knowledge management (Wehner et al. 2017) as well as organizational socialization (Leidner et al. 2018). Such solutions can be used for problem-solving, discussing about work and new ideas, promoting events, sharing new updates, managing tasks, and having informal talks (Mäntymäki and Riemer 2016). For the purpose of this study, we analyze ESNs from two large multinational corporations. Both company A and B operate in the manufacturing industry and have more than 20,000 employees each. The datasets for both are drawn from Yammer, a private platform mainly used for communication and collaboration within organizations. Like other social networking sites, Yammer includes features, such as instant messaging, managing private and public groups, sharing files, links, and images, tagging content and other users, and searching existing content. Individuals can be members in a variety of public or private groups. Within these groups, multiple message threads exist that consist of the initial message and replies to it.

Our dataset covered data over a 4-year period from company A, and over a 2-year period from company B. Excluded were users that were part of the Yammer network for less than one year; we also excluded those users that had sent less than 5 messages overall to eliminate "non-users." Only English messages were considered and those posted in public groups (for privacy and confidentiality reasons). Messages were also anonymized, i.e., user names were removed. The resulting data set included 71,139 messages from 2,346 Yammer users at company A, and 28,341 messages from 839 Yammer users at company B.

## Data Analysis

Previous studies have used correlation analysis in order to model the relation between personality traits and word use (e.g. Yarkoni 2010). We deem this approach an appropriate first step in validating the measurement. Apart from activity and connectivity measures that are well-established, we present the correlation results of activity and connectivity with one of each content measurement per facet (see Table 2). In other words, Table 2 showcases how each facet (as represented by one measure only) is correlated with the traditional set of activity and connectivity measures. Questions, such as "Do active users also tend to be more personal, curious, polite, and sharing?" can be answered this way.

The data analysis was done with statistical programming language R (version R-3.5.1) using RStudio development environment. R packages used for the analysis are: *plyr, dplyr, lubridate, data.table, stringr, textclean, tidytext, textcat, lexicon,* and *Hmisc*. To measure correlations among measures, we used Spearman's rank-order correlation, since we have highly skewed distributions, which makes methods like Pearson's correlation relying on linear relationship between normally distributed values unsuitable. Due to the skewedness and inclusion of zero values (e.g., in cases where a person never uses any of the words in the word lists), Spearman's rank-order correlation, as a non-parametric version of Pearson's correlation, is more suitable for the analysis, considering the nature of the data (Yarkoni 2010).

The relationship between the data is not always linear, and in these cases the Spearman's rank-order correlation should be used instead of the Pearson's correlation. The relationship might also not be

monotonic and in these cases statisticians often use either Spearman's rank correlation coefficient or Spearman's rho or Kendall's tau, so both should bring decent results with regards to the nature of our data.

## Preliminary Results

The following Table 2 shows 30 correlations between these metrics, 19 of which (63.3%) were statistically significant at $p<0.001$ level. The magnitude of some correlations may seem relatively modest in comparison to the effect sizes reported by other correlation studies. However, the magnitude is close to the mean statistically significant effect size presented by other similar studies applying correlation analyses for word use categories (e.g., Mehl et al. 2006). It has been found that the modest effect sizes are more common for bigger sample sizes, but are also likely to be more representative of the true population effects (Yarkoni 2010).

**Table 2. Spearman's Rank Order Correlations Between Socialness Measures**

| **Dimension** | **Activity** | | **Connectivity** | | **Content** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Measure | Sent messages | | Degree centrality | | Being personal | | Being curious | | Being polite | | Sharing | |
| | | | | | Individualism | | Asking questions | | Sentiment | | Reference sharing | |
| Case company | A | B | A | B | A | B | A | B | A | B | A | B |
| Sent messages | 1 | 1 | 0.75*** | 0.89*** | -0.01 | 0.04 | 0.00 | 0.18*** | -0.02 | 0.03 | 0.23*** | 0.25*** |
| Degree centrality | 0.75*** | 0.89*** | 1 | 1 | 0.18*** | 0.1 | 0.12*** | 0.18*** | -0.01 | 0.1 | 0.09*** | 0.16*** |
| Individualism | -0.01 | 0.04 | 0.18*** | 0.1 | 1 | 1 | 0.34*** | 0.21*** | -0.17*** | -0.05 | -0.12*** | 0.04 |
| Asking questions | 0.00 | 0.18*** | 0.12*** | 0.18*** | 0.34*** | 0.21*** | 1 | 1 | -0.25*** | -0.3*** | 0.17*** | 0.42*** |
| Sentiment | -0.02 | 0.03 | -0.01 | 0.1 | -0.17*** | -0.05 | -0.25*** | -0.3*** | 1 | 1 | -0.01 | -0.23*** |
| Reference sharing | 0.23*** | 0.25*** | 0.09*** | 0.16*** | -0.12*** | 0.04 | 0.17*** | 0.42*** | -0.01 | -0.23*** | 1 | 1 |

*p < .05; **p < .01; ***p < .001. All correlations are based on a minimum N of 839.

The strongest correlation is shown between activity levels, i.e., the number of messages sent, and connectivity levels, i.e., the number of people a person has been in contact with. The correlation suggests that high numbers of messages are sent to a diverse set of people, instead of having ties with only a few persons. The results also show that both activity and connectivity levels are positively correlated with shared references, and also partly with asking questions. This suggests that the more active and connected a person is, the higher the ratio of asking questions and sharing references with others. Interestingly, and in contrast to company A, company B shows no correlation between activity levels and the rate of asking questions. Such deviations might derive from differences in the purpose of each ESN (Richter and Riemer 2013). For example, one ESN might be used more intensely for Q&A than the other. Another finding is that the sentiment of a person is negatively correlated with the ratio of asking questions. That is, the tone of a person asking a lot of questions seems to be less positive than the tone of a person who does not ask as many questions. Similarly, sentiment negatively correlates with individualism. Looking at the data in more detail, it shows that people who are talking more in the first-person singular form also tend to raise some problems or issues, which are associated with more negative tone. This is especially the case with company A, where people use the ESN proportionally more for finding help, especially when they face some technical issues.

Overall, Table 2 shows that while there are dependencies between our newly developed content measures and traditional measures, their strength is moderate at best (all correlations are below 0.25). For example, the sentiment of a message does not correlate significantly with any of the traditional measures. This indicates that our content facets do indeed capture other aspects of socialness than those captured by traditional social network analysis.

## Future Steps

While these results are exploratory and only constitute a first step into the empirical analysis of the new measurement, in the next research phase we intend to scrutinize the relationships between the dimensions of socialness in more detail. In addition, we will also establish a two-by-two segmentation for ESN users based on divisions of their activity and connectivity levels below and above a median ESN user. This will allow us to contrast the mean values for each facet of the content dimension with each of the activity and connectivity levels to get a better understanding if and how socialness in the social networking context varies, and if there are identifiable subcategories of socialness.

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