

HIERARCHY OR ACTIVITY? THE ROLE OF FORMAL AND INFORMAL INFLUENCE IN ELICITING RESPONSES FROM ENTERPRISE SOCIAL NETWORKS

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HIERARCHY OR ACTIVITY? THE ROLE OF FORMAL AND INFORMAL INFLUENCE IN ELICITING RESPONSES FROM ENTERPRISE SOCIAL NETWORKS

Complete Research

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Abstract

Social media makes fast inroads into corporate workplaces. Enterprise Social Networking (ESN) is associated with improved communication, information-sharing and has been argued to lead to more democratic communication patterns, whereby users increasingly derive authority from their contributions to the network rather than their position in the formal hierarchy. At the same time, this development remains largely un-explored empirically. Against this background, we explore the influence of both a user's hierarchical level and level of communication activity on their ability to elicit responses from other ESN users. We draw on a unique data set of more than 110,000 messages collected from the ESN platform Yammer at Deloitte Australia. We confirm the existence of both kinds of influence, formal and informal, yet we show that communication activity has a much stronger effect than a user's hierarchical position. We conclude that communication behaviour has a bigger influence on information diffusion than formal hierarchies. This points to the potentials of enterprise social networks in improving organic, user-driven communication and knowledge sharing within firms.

Keywords: enterprise social networking, microblogging, Yammer, communication analysis, hierarchy, response behaviour, influence.

Introduction

Following the rapid diffusion of social media such as Facebook and Twitter in the public space, similar platforms have made fast inroads into the workplaces of corporations with the intention to improve communication practices (Bughin and Chui, 2013; Meske and Stieglitz, 2012; Richter et al., 2011; Riemer et al., 2010; Stocker et al., 2012). Besides their potential benefits for knowledge transfer and collaboration, the usage of social media also leads to huge data sets of structured and unstructured data that can be analysed by researchers or managers (Stieglitz et al., 2014). Social media platforms generally include wikis, social intranet platforms, blogs, as well as enterprise social networking (ESN). ESN platforms offer new possibilities for communication, such as enterprise microblogging

functionalities, and make it easier to find, connect and interact with colleagues (Aoun and Savanid Vatanasakdakul, 2012).

Proponents of ESN have argued that such platforms will allow all employees to have a voice and let them interact as equals across hierarchical levels (McAfee, 2009). Consequently, it has been argued that the role of formal hierarchy will diminish, while authority will increasingly derive from what people contribute to the network (e.g. Tapscott and Williams, 2006) and from reciprocity in communication behaviour (Kane et al., 2012; Kankanhalli et al., 2005; Gu and Jarvenpaa, 2003). While this view is widely shared among vendors and commentators in the blogosphere, actual research investigating the relationship between hierarchy, communication behaviour, and user influence has not yet been forthcoming.

Against this background, in this study we investigate the relationship between users' hierarchical position and their communication behaviour on the one hand and the ability to elicit responses from other users in the ESN on the other. Access to a unique data set enables us to base this study on actual communication data rather than data elicited from surveys or interviews. Our data set was extracted from the ESN platform Yammer at Deloitte Australia. One of the main features of Yammer is enterprise microblogging, the exchange of short messages in conversation streams. Our data covers a time frame of almost four years and comprises more than 110,000 messages written by 6,212 users.

We test two main hypotheses: 1) the influence of a user's hierarchical position (formal influence) on the ability to elicit responses from other users, and 2) the influence of a user's level of communication activity (informal influence) on the ability to elicit responses. Response behaviour is defined by the quantity and speed of responses of other users to the initial message. We find evidence for both types of influence, but that informal influence is much stronger. In doing so, we confirm long-held beliefs that ESN will shift authority away from formal hierarchy toward more bottom-up, communication-based authority grounded in network members' contributions.

Our study contributes to deriving a better understanding of communication in ESN in general and the role of formal and informal authority in particular. Understanding the structure and dynamic of enterprise communication networks is crucial, as they impact on the performance of knowledge-centric organizations (Wu and Chang, 2013; De Ridder, 2004; Fischbach et al., 2004). If the influence of organizational hierarchy on communication behaviour is lower than other variables, information flow might deviate from the formal "org chart", which can lead to positive effects of broader information diffusion (Stieglitz and Dang-Xuan, 2013; Aral et al., 2007).

We begin by providing some background on ESN and microblogging, as well as the influence of hierarchy on enterprise communication. We then derive our research model and hypotheses, before we describe the case company and data set. After presenting our results we discuss the findings in the context of the emerging research stream on ESN. We conclude by outlining contributions.

1 Literature Review

In this section, we discuss the concept of microblogging in the context of ESN and we review related literature. Furthermore, we provide an overview of literature that focuses on formal as well as informal hierarchy and authority in organisations, which we juxtapose with the importance of communication behaviour in the context of ESN.

1.1 Microblogging in Enterprise Social Networks

In the wake of what has been termed the Web 2.0, a new breed of Internet platforms has emerged: social platforms that provide easy-to-use features that encourage participation, social networking and

the exchange of short messages (e.g. Huberman et al., 2009; Richter et al., 2011). Given the widespread use of services such as Twitter or Facebook in the public domain social platforms have made fast inroads into organisations. These services are commonly associated with practices of information sharing, communication and group work, collectively referred to as Enterprise 2.0 (McAfee, 2009).

Consequently, early research in the field has investigated the associated potentials of deploying various kinds of platforms within the workplace (e.g. Ip and Wagner, 2008; DiMicco et al., 2008). Many of these studies explore particular aspects, including the type and volume of contributions, the relationship between consuming content and contributing, the quality of user generated content, user motivation, the benefits for the individual and the organization or the perceived barriers or rules of use (e.g. Holtzblatt et al., 2010; Stocker et al., 2012).

In this study, we focus on what has been termed enterprise microblogging (EMB) (e.g. Zhao and Rosson, 2009), the exchange of short messages that enables conversational practices within enterprise social networks (ESN). Termed „enterprise Twitter“ (Gupta et al., 2012), microblogging is said to enable new forms of lightweight communication, where users share and broadcast small chunks of information about themselves, their work, or anything else of interest. Examples of corresponding enterprise platforms are Yammer, Tibbr, Mumba Cloud or Jive; microblogging has been recognised as a means for enhancing communication and collaboration (Gartner, 2009).

An emerging body of scholarly work has already investigated various general aspects of enterprise microblogging, such as adoption (e.g. Riemer et al., 2012; Schöndienst et al., 2011; Meyer and Dibbern, 2010; Günther et al., 2009) as well as usage and associated benefits (Zhao et al., 2009; Zhang et al., 2010; Riemer et al., 2011). Williams and Schubert (2011) investigated the motivation, supported work and activities as well as the contributions of Yammer in a large consultancy as part of an empirical study of enterprise social software. Cleveland (2012) who aimed at determining the user acceptance of Yammer as a tool for knowledge creation and reuse in ICT projects and its dependent variables, applying the UTAUT framework by Venkatesh et al. (2003). Finally, in a detailed comparison of multiple case studies Richter and Riemer (2013) found that use cases are diverse, and include information storage, social praise, and work coordination.

In this study we investigate the role of organizational structure on the communication behaviour in ESN-based microblogging. In doing so, we theorize on the relationship between users' position in the organizational hierarchy and the effect on communication behaviour in the enterprise social network.

1.2 Hierarchy and Communication in ESN

One of the main aims of organizations is to coordinate complex activities among a number of people in order to accomplish work and achieve business goals (Fritz et al., 1998). A common way of dividing and organizing people in business organizations is by way of forming a hierarchy. Weber (1921) described hierarchy as a “vertical formal integration of official positions within one explicit organizational structure”. Many other definitions for hierarchy exist. In general terms, they can be described as an “ordered set of entities that can be classified as being inferior, superior or on the same level as one other” (Putzke et al., 2010). In many organizations formal hierarchical structures organize the flow of information (Johnson et al., 1994).

It is widely accepted that hierarchies represent a natural organization mechanism in that almost all social systems are structured as group-based social hierarchies (Diefenbach and Sillince, 2011; Sidanius et al., 2004; Scott, 1990; Laumann et al., 1971). Moreover, any new social system, even without a formal description of dominance-subordination relationships, will still tend to build out a

social hierarchy. Or as Putzke et al. (2010) put it: people are “more likely to seek a tie that establishes social hierarchy than seeking a tie that does not establish social hierarchy.”

Hierarchical structures are not only linked to the formal monitoring and controlling of employees but also to the flow of information within the organization, maintaining hierarchical communication patterns (Friebel and Raith, 2004). At the same time, while hierarchies describe (formal) organizational relationships, communication structures will often differ as people establish informal relationships. In particular, the emergence of new information technologies has provided people with new and easy ways to communicate and interact digitally within organizations at a larger scale. The results are informal hierarchies and self-creating structures and processes (Oberg and Walgenbach, 2008; Ugbah and Dewine, 1989).

Diefenbach and Sillince (2011) define informal hierarchy as „person-dependent social relationships of dominance and subordination, which emerge from social interaction and become persistent over time through repeated social processes, especially routine behaviour.“ A plethora of studies has demonstrated the existence of informal hierarchies, by e.g. analysing the emergence of informal hierarchy in different types of organizations, such as hybrid and network organizations (Schwarz, 2006; Ekbah and Kling, 2005; Nelson, 2001) or by descriptive analysis of formal and informal network organizations (e.g. Rank, 2008; Allen et al., 2007; Guimerà et al., 2006). In their meta-analysis, Diefenbach and Sillince (2011) discovered that informal hierarchies often emerge unrecognized and that they can become the dominant structure, referred to as the principle of communicative dominance.

Authority in organizations is generally legitimized by way of position within the formal hierarchy. However, according to Aghion and Triole (1997) “formal” authority needs to be distinguished from “real” authority: the former describing the “right to decide” while the latter describes the “effective control over decisions”. According to Kleinijnhuis et al. (2011), authority and influence in networks is more likely based on expertise and connectedness than on formal specifications. This observation is supported by Hirokawa and Johnson (1989) who state that authority and power are constructed through and based on social interactions among group members.

Against this backdrop, proponents of ESN and Enterprise 2.0 have long argued that the application of social technologies in the workplace has the potential to change the dynamic of authority and influence, in the process diminishing the role of formal hierarchy and giving more weight to people’s contributions in the network. McAfee (2009) stated that the fundamental idea of “Enterprise 2.0 is about giving many more people within the organization a voice, letting them interact as equals...”. (p. 207). Tapscott (2006) argued that, “as self-organization becomes accepted as a viable method of production, more processes within the organization will move from being hierarchically directed, proprietary and closed to self-organizing, shared and open.” Similarly, in recent studies scholars have argued that hierarchy has a decreasing influence on communication and collaboration because ESN provides higher social capital benefits for employees in disadvantaged positions, like new or young employees and others in hierarchically lower positions (e. g. Durst et al., 2013; Steinfield et al., 2009).

In line with these arguments, we investigate the role of both formal and informal influence in eliciting responses from users in Enterprise Social Networks. Specifically, we investigate both, if a user’s position in the formal hierarchy influences other users in their response behaviour, and if response behaviour is influenced by users’ contributions to the network. In other words, we aim to find out if users derive influence from their position in the hierarchy or from their contributions to the ESN.

2 Hypotheses and research model

Following the line of argument above we theorize that, while users might derive influence in ESN from their formal position in the organizational hierarchy, users might also derive influence from being strong contributors in the network. We measure influence using response behaviour of other users as an outcome variable. In other words, are users in either high-level hierarchical positions or those who exhibit high levels of communication activity able to elicit more responses to their messages from the ESN as other users?

While scholars have argued that it is possible for informal influence to emerge in ESN derived from contributions in the network, none of the reviewed literature indicates a total loss of influence of formal hierarchy. In fact, we would expect that users in enterprise social networks want to follow their superiors and respond to their messages quickly and diligently, in particular because such behaviours are publicly visible on the platform. Therefore, we theorize that the hierarchical position of an ESN user will have a positive effect on the response behaviour of other employees within the enterprise social network. Correspondingly, we seek to test the following hypotheses:

H1a: The higher the position of a user in the hierarchy, the higher is the probability to receive a reply.

H1b: The higher the position of a user in the hierarchy, the higher is the number of replies.

H1c: The higher the position of a user in the hierarchy, the shorter is the time before receiving the first answer.

At the same time as we theorize that hierarchy position influences employees' behaviour, we also assume that the emerging informal hierarchy will have an impact. As argued above, users can derive authority from their communication behaviour in the network. We reason that the frequency of a user's postings might affect the response behaviour of other users. This relationship is further backed by works on social reciprocity: people tend to share information and knowledge with those in the network from whom they have received help before or assume to get help in the future (Musembwa and Paul, 2012; Faraj and Johnson, 2011). Therefore we theorize that a user's level of communication activity, as measured by the number and frequency of a user's posts, will have an impact on the response behaviour of other users in the network. Correspondingly, we seek to test the following hypotheses:

H2a: The higher a user's communication activity, the higher is the probability to receive a reply.

H2b: The higher a user's communication activity, the higher is the number of replies.

H2c: The higher a user's communication activity, the shorter is the time before receiving the first answer.

The testing of these two sets of hypotheses allows a comparison of the impacts of the two variables "hierarchical level" and "communication activity" on the response behaviour of other users in the network. Response behaviour is operationalized as 1) the probability to receive a reply, 2) the number of replies, and 3) the timeliness of the response. Contextually, the two independent variables differ from each other significantly, as one is formally determined (position in the organisational hierarchy), while the other is influenced by users themselves (communication activity). Figure 1 shows our research model. We test the model with data from the ESN platform Yammer, collected from Deloitte Australia.

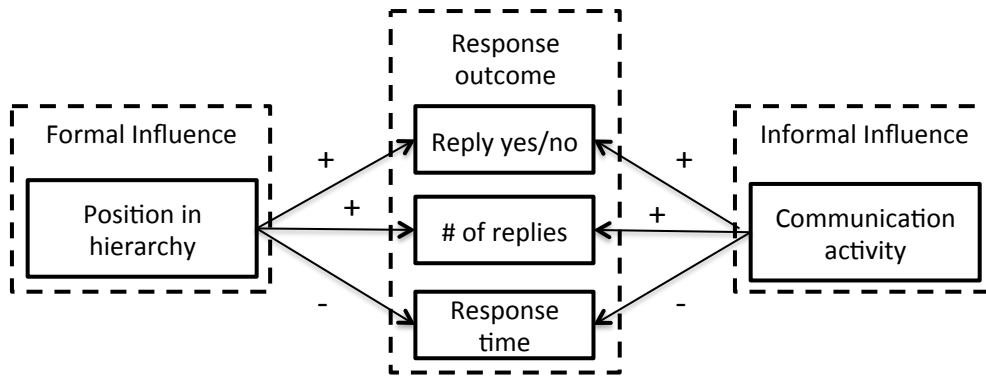


Figure 1. Research model of the study

3 Case Context and Data Collection

Our data was collected from Deloitte Australia. Deloitte, founded in 1845 in London, operates as a network of independent firms in more than 150 countries. Deloitte is a professional services firm that provides its clients with auditing, consulting, financial advisory, risk management, and tax services. As of 2012, the Australian partnership of Deloitte Touche Tohmatsu has approximately 512 partners with over 5,700 people located in 12 offices across the country.

Yammer Inc launched its platform in September 2008. At the same time, a group of Deloitte consultants began experimenting with the platform. Yammer is an ESN service that is used by more than 100,000 companies and is claiming a user base of more than four million.¹ The service is organised using the concept of networks, with each network typically representing one company. Anyone can create a network by registering with his or her corporate email address and new users can join thereafter. Like Twitter, Yammer is based on the "follower"-principle where users can choose which others to follow. Users can view this personalised stream or follow the "all company" stream. Unlike Twitter, Yammer provides a group feature. Public groups can be viewed by all network users and are open to join, while communication in private groups are only visible to invited members.

Yammer in Deloitte emerged bottom-up and organically. The platform was not officially rolled-out to the user based, but in its initial phase adopted and diffused by word-of-mouth. However, the platform was later endorsed by senior management and actively promoted. Yammer was widely adopted with more than 90% of employees using the platform as of 2012. A previous, qualitative analysis of Yammer data at Deloitte unveiled that Yammer was used extensively in the context of the knowledge-intensive consulting and auditing practice in the company (Riemer and Scifleet, 2012). In particular, Yammer at Deloitte was used to provide input for other users, for idea generation and brainstorming, problem-solving, and the crowdsourcing of solutions and expert advice. Only less than 10% of communication was non-work related.

Our data covers the period between September 2008 and July 2012 and is based on communication of 6,212 unique user accounts who posted at least one message (note that number of users is higher than the total number of employees in 2012 because of high employee turnover in this industry). During this time 130,503 messages were posted on the platform, across 445 public groups and 277 private groups and the all-network stream. Our study concentrates on the 110,877 public messages, i.e. those

¹ See: <http://www.socialnetworkingwatch.com/yammer/>

posted in the all-network stream and public groups, for two reasons: Firstly, our questions can only be answered by analysing a large amount of communication which is accessible by the majority of employees who can potentially respond to such messages. Secondly, private groups and private messages might contain private information and are thus excluded from any analysis we carry out on the data set.

Deloitte provided the dataset in MS Excel format. Besides the (text-) body of the messages, six more columns comprise the following (meta) information: a reference to the post it replied to, a thread unique identifier (UID), the timestamp, a group name, a user UID and information if a file was attached to the post. Every post has a UID and is automatically part of a thread. If it is not a reply post a new thread UID is created. All messages in a thread share a common thread UID. Due to the possibility to comment on other posts, they can also hold the UID of the post to which they reply. We would like to note that any user or client names were removed from the data set to ensure anonymity. Furthermore, we removed bot postings and messages that only contained meta-information (e.g. „user abc has joined the Deloitte network“).

In addition to the Yammer meta data, the company provided information from its human resources system on users' formal position and work context. However, the matching of data between the systems allowed to only make available this data for 65% of the Yammer user base. However, we reason that this sample is large enough and thus allows us to determine the position of users in the hierarchy of the company. Communication behaviour in turn can be inferred from the Yammer data directly.

4 Data Analysis and Results

In this section we report on our result. We provide descriptive statistics that are of relevance to our study, before we outline our regression analysis and associated findings.

4.1 Descriptive Statistics

For 65% of the employees registered on the Yammer platform we were able to obtain information regarding their position and work context exported from the company's HR systems. In this population, 94% of employees work full-time, 55% are male and 45% female. As table 1 shows, all hierarchical levels are represented in the data, from personal assistants (4%) or senior consultants (19%) up to partners and principals (12%). This data was obtained at the end of our analysis period in 2012.

Level	Positions	Share	Number
1	Personal assistants	4%	249
2	Graduates	16%	994
3	Consultants, Analysts, Coordinators	19%	1,180
4	Senior consultants, Senior analysts	19%	1,180
5	Managers, Client managers	15%	932
6	Directors, Senior directors, Account directors	15%	932
7	Partners, Principals	12%	745
Sum		100%	6,212

Table 1. Hierarchical levels

While the Yammer data set is limited to messages generated by employees of Deloitte Australia, these employees were located in different departments and in different locations (e.g. 40% in Sydney, 34%

in Melbourne). Overall employees from 19 service lines were active in the Yammer network. However, people from consulting service line published 44% of all messages.

4.2 Regression Analysis

For our analysis we operationalized the three dependent variables as follows:

- “reply” is a binary variable: either a message has been replied or not
- “reply_no” describes the number of replies to a message,
- “reply_lag” describes the time lapsed before a message receives its first response.

We employ a number of independent and control variables; these can be grouped into user-, and message-level variables.

First, the independent variables hierarchy and communication activity operate at the user level. Hierarchy is used to test H1a to H1c. Communication activity (*log_activity*) as an independent variable is used to test H2a to H2c. We determine ‘communication activity’ based on the number of published messages associated with a user account.

Second, we considered message-level characteristics to derive a number of control variables. As it will make a difference to the number of responses elicited if a message is a question, we included this variable in our statistical analysis (see table 2, 3, 4). In addition, we included wordcount of a post as a control variable, since previous works have shown that longer messages can generate more conversation and thus more responses (Huffaker, 2010). Another message-level characteristic is whether or not a URL was included in the post. Suh et al. (2010) have shown that Twitter messages with hyperlinks are significantly more retweeted; Stieglitz and Dang-Xuan (2012) came to the same conclusion for wall posts on Facebook.

We applied logistic regression for the variable “reply”, negative binomial regression for the variable “reply_no”, and OLS regression for the variable “reply_lag” to analyse the effects of user-, and message-level characteristics on the probability, quantity and speed (timelag) of replies. Multicollinearity tests suggest that multicollinearity is not a problem in our data.

4.3 Findings

Table 2, 3, and 4 show the results of our empirical analysis. Note that *b* denotes estimated coefficient and $\exp(b)$ exponentiated coefficient. Estimated robust standard errors are shown in parentheses. *, ** and *** indicate significance level at 10%, 5% and 1%, respectively.

Independent Variables	Dependent Variable: <i>reply</i>	
	<i>b</i>	$\exp(b)$
<i>hierarchy</i>	0.01** (0.00)	1.01
$\log(\text{activity})$	0.07*** (0.01)	-
<i>question</i>	0.96*** (0.02)	2.61
$\log(\text{wordcount})$	0.28*** (0.01)	-
<i>URL</i>	0.17*** (0.02)	1.19
Pseudo R^2	0.08	
# Observations	110,877	

Table 2. Logistic Regression Results

Independent Variables	Dependent Variable: <i>reply_no</i>	
	<i>b</i>	<i>exp(b)</i>
<i>hierarchy</i>	0.01** (0.00)	1.01
<i>log(activity)</i>	0.07*** (0.01)	-
<i>question</i>	1.08*** (0.02)	2.94
<i>log(wordcount)</i>	0.29*** (0.01)	-
<i>URL</i>	0.22*** (0.02)	1.25
Pseudo R^2	0.05	
# Observations	110,877	

Table 3. Negative Binomial Regression Results

Overall 28,964 messages received a direct reply and were therefore considered to test hypotheses H1c and H2c (table 4).

Independent Variables	Dependent Variable: <i>reply_lag</i>	
	<i>b</i>	<i>exp(b)</i>
<i>hierarchy</i>	0.17*** (0.01)	
<i>log(activity)</i>	-0.11*** (0.01)	
<i>question</i>	-0,05 (0.03)	
<i>log(wordcount)</i>	0.21*** (0.02)	
<i>URL</i>	0.33*** (0.04)	
R^2	0.05	
# Observations	28,964	

Table 4. OLS Regression Results

4.3.1 User-level characteristics: testing our hypotheses

H1 is generally supported. We found that hierarchical level is positively correlated with probability and quantity of replying, albeit with only very small effect sizes (see table 2 and 3). At the same time however, hierarchy is positively correlated with time until first reply, not negative as hypothesized, yet also with very small effect size. This means that messages from users in higher positions elicit slower first responses on average.

H2 is also supported. Communication activity is positively correlated with probability and quantity of replies. Here, we found a much larger effect size (compared to hierarchical level). Communication activity is also negatively correlated with timelag to first reply (i.e., messages from active users elicit quicker responses).

4.3.2 Message-level characteristics: control variables

Questions are positively correlated with probability and quantity of replying. By contrast, questions are uncorrelated with time lag to first reply.

Wordcount is positively correlated with probability and quantity of replying. Wordcount is also positively correlated with timelag to first reply (i.e., lower reply speed).

Similar to findings from other studies we found that containing a URL is positively correlated with probability and quantity of replying. However, we also found that containing a URL is positively correlated with timelag to first reply (i.e., lower reply speed).

5 Discussion

Our findings show that both hierarchy and communication activity have a significant effect on a user's influence to elicit response behaviour in ESN. While these findings are generally not unexpected and confirm our hypotheses, a closer look at the more detailed findings reveals some interesting insights.

Firstly, while a user's hierarchical level has a statistically significant influence, this influence is quite marginal and likely not to matter in day-to-day practice. For example, a user who outranks another user by one level in the hierarchy is able to elicit on average 1% more responses. Interestingly, we found a much stronger effect size of 'communication activity' on response behaviour. These findings suggest that ESN have indeed a positive effect on the inclusion of users in the organisation beyond and independent of hierarchical structures.

Secondly, while H1 in general was supported, the effect for H1c, while significant, was invers to what we theorized. Messages from users in higher positions elicit slightly slower responses on average. We reason that people might need more time to find and formulate an adequate answer or take more care in editing replies to users in higher positions. The underlying cause might either be a perceived social/formal distance between the communication partners or the fact that people on higher hierarchical levels ask more complex questions.

Thirdly, the number of words in a message, the inclusion of a URL and messages containing questions all have a strong influence on the response behaviour. Longer posts are thus more likely to initiate longer conversations, presumably due to the particular nature of these posts in outlining more complex and/or more controversial matters. Messages that contain URLs are often particularly valuable for the user group, as they are associated with contributing new ideas and background material to the community discourse. Users consequently both comment on such content, but also thank the contributor for sharing the URL, thus generating replies. Finally and not surprisingly, questions elicit more responses than non-questions. All three findings make intuitive sense, which we take as a good sign that our data set is indeed a useful basis for our primary analysis.

In summary, our study confirms the long-standing argument put forward by ESN vendors and proponents in the media that the kinds of social networks that emerge from ESN platforms can lead to a re-balancing of influence in organisations – away from formal hierarchy toward recognising user contributions. In other words, people who have something to contribute will be recognised by the organisational community and be able to derive influence from their standing, even if they do not inhabit high-level hierarchical positions. At the same time, our findings show that formal hierarchy does not lose its influence, as both formal and informal hierarchy show up in our data.

Our study is circumscribed by certain design choices and the nature of the data set. Firstly, our findings are derived from one company only, albeit one that is well suited for our study as it stems from a knowledge-intensive industry that and relies heavily on individuals' contributions and a company that is highly hierarchically structured. Moreover, previous work has shown that Yammer is indeed used for the core knowledge work at the case organisation. Secondly, the data set is based on Australian employees. Therefore, the results might not be directly transferable to other nations or cultures, especially beyond a Western societal context. Thirdly, our analysis at this point is only based on direct relationships between the two influence variables and the three outcomes variables. In this paper we simplified the variable hierarchy because we treated it as a numeric variable. To be more robust, we plan to specifically explore which level of hierarchy has which influence. Future analyses will also have to test 1) interaction effects between the independent variables (e.g. if users on higher levels can draw advantages from higher contributions), 2) interaction effects between the independent and control variables (e.g. do people on higher levels ask more questions or write longer messages that

in turn might elicit more responses), 3) changes over time (e.g. does influence or formal influence emerge or diminish over time?), and 4) the role of reciprocity (e.g. more specific interactions between particular users). Finally, our analysis is based on quantitative data only. For example, someone who communicates a lot might not necessarily have a high influence on the organization as they might engage in private communication, gossip, sharing of non-work-related (but maybe funny) news, etc. A future study could conduct content analysis in conjunction with quantitative analysis to better understand the dialogues and communication behaviour of the employees in deriving influence from the network.

6 Conclusion

We have investigated influence in enterprise social networking using a unique data set. We theorized that users' influence in ESN derives not only from formal hierarchy, but also informally from their contributions to the ESN community. Our results confirm both forms of influence, with a stronger influence of communication activity on eliciting responses from other users. In other words, communication behaviour of employees has a much stronger effect on response behaviour than their hierarchical position. Given the challenges in obtaining good ESN data, we expect our study to be the first in the field to investigate these relationships.

Our study contributes to the on-going stream of research into ESN in particular and social technologies in general. Our findings help derive a better understanding of communication effects in ESN platforms. To our knowledge, no research has been done on the impact of user-level characteristics on the probability, quantity as well as speed of replies in social media communication. Most existing studies use data from public social media such as Twitter, which are not transferrable into workplace contexts, or rely on survey data, because actual ESN data is hard to come by. However, when investigating communication behaviour, surveys are much less effective than the use of actual communication data, as the latter allows a more objective analysis with less subjective bias.

Our results also have important practical implications. An increasing number of organisations introduce enterprise social media with the aim to simplify the vertical and horizontal communication across hierarchies and departments. According to our findings, managers need to be aware of the dynamics in such virtual environments. Compared to hierarchy, other variables have higher influence on communication behaviour and influence in ESN. This points to the emergence of informal hierarchies, which can have positive as well as negative consequences. On the one hand, informal hierarchies may diminish managers' "actual" authority. On the other hand, prolific knowledge workers on all hierarchical levels might benefit, as they are able to draw on the network for contributions, not having to rely on information flows along the organisational hierarchy.

References

- Aghion, P. and J. Tirole (1997). Formal and Real Authority in Organizations. *Journal of Political Economy*, 105 (1), 1-27.
- Allen, J., A.D. James and P. Gamlen (2007). Formal versus informal knowledge networks in R&D: A case study using social network analysis. *R&D Management*, 37 (3), 179-196.
- Aoun, C. and S. Vatanasakdakul (2012). Social Media in the Workplace: Key Drivers for Inclusive Innovation. In *Proceedings of the Americas Conference on Information Systems (AMCIS)*. Paper 13, Seattle, USA.
- Aral, S., E. Brynjolfsson and M. van Alstyne (2007). Productivity Effects of Information Diffusion in E-Mail Networks. In *Proceedings of the 28th International Conference on Information Systems (ICIS)*. Paper 17, Montreal, Canada.

- Bughin, J. and M. Chui (2013). Evolution of the networked enterprise, McKinsey Global Survey results, from http://www.mckinsey.com/insights/business_technology/evolution_of_the_networked_enterprise_mckinsey_global_survey_results (accessed 2013-11-10).
- Cleveland, S. (2012). Using Microblogging for Lessons Learned in Information Systems Projects (2012). International Research Workshop on IT Project Management 2012. Paper 15.
- De Ridder, J. (2004). Organisational communication and supportive employees. *Human Resource Management Journal*, 14 (3), 20-30.
- Diefenbach, T. and J. Sillince (2011). Formal and Informal Hierarchy in Different Types of Organization. *Organization Studies*, 32 (11), 1515-1537.
- DiMicco, J.M., D. Millen, W. Geyer, C. Dugan, B. Brownholtz and M. Muller (2008). Motivations for Social Networking at Work. In Proceedings of the 11th Conference on Computer Supported Cooperative Work, ACM Press, San Diego.
- Durst, C., J. Viol and N. Wickramasinghe (2013). Online Social Networks, Social Capital and Health-related Behaviors: A State-of-the-art Analysis. *Communications of the Association for Information Systems*, 32, Article 5.
- Ekbia, H. R. and R. Kling (2005). Network organizations: Symmetric cooperation or multivalent negotiation? *Information Society*, 21, 155-168.
- Faraj, S. and S.L. Johnson (2011). Network Exchange Patterns in Online Communities. *Organization Science* (22:6), 1464-1480.
- Fischbach, K., P.A. Gloor and D. Schoder (2004). Analysis of Informal Communication Networks – A Case Study. *Business & Information Systems Engineering*, 1, 40-149.
- Friebel, G. and M. Raith (2004). Abuse of authority and hierarchical communication, *RAND Journal of Economics*, 35, 224-244.
- Fritz, M.B., S. Narasimhan and H. Rhee (1998). Communication and Coordination in the Virtual Office. *Journal of Management Information Systems* I, 14 (4), 7-28.
- Gartner (2009). Hype Cycle Special Report Evaluates Maturity of 1,650 Technologies. from <http://www.gartner.com/it/page.jsp?id=1124212> (accessed 2013-10-09).
- Gu, B. and S. Jarvenpaa (2003). Online Discussion Boards for Technical Support: The Effect of Token Recognition on Customer Contributions. In Proceedings of the International Conference on Information Systems (ICIS). Paper 10, Washington, USA.
- Guimerà, R., L. Danon, A. Díaz-Guilera, F. Giral and A. Arenas (2006). The real communication network behind the formal chart: Community structure in organizations. *Journal of Economic Behavior & Organization*, 61, 653-667.
- Günther, O., H. Krasnova, D. Riehle and V. Schoendienst (2009). Modeling Microblogging Adoption in the Enterprise. In Proceedings of the Americas Conference on Information Systems (AMCIS), Paper 544, San Francisco, USA.
- Gupta, H., B. Nicholson and M. Newman (2012). Usage, Impediments And Attitudes Towards Social Media In UK Building Societies. In Proceedings of the Pacific Asia Conference on Information Systems (PACIS), Paper 159, Ho Chi Minh City, Vietnam.
- Hirokawa, R.Y. and D.D. Johnston (1989). Towards a general theory of group decision making: development of an integrated model. *Small Group Behavior*, 20 (4), 500-523.
- Holtzblatt, L., L. Damianos and D. Weiss (2010). Factors Impeding Wiki Use in the Enterprise: A Case Study. In Proceedings of the 28th Annual SIGCHI Conference on Human Factors in Computing Systems, ACM Press, Atlanta.
- Huberman, B. A., Romero, D. M. and Wu, F. (2009). Social networks that matter: Twitter under the microscope. *First Monday* (14).
- Huffaker, D. (2010). Dimensions of leadership and social influence in online communities. *Human Communication Research*, 36 (4), 593-617.
- Ip, K.F.R. and C. Wagner (2008). Weblogging: A study of social computing and its impact on organizations. *Decision Support Systems* (45:2), 242-250.

- Johnson, J. D., W.A. Donohue, C.K. Atkin and S. Johnson (1994). Differences Between Formal and Informal Communication Channels. *Journal of Business Communication*, 31 (2), 111-122.
- Kane, G., S. Ransbotham and A. Boynton (2012). Is High Performance Contagious among Knowledge Workers?. In Proceedings of the 33rd International Conference on Information Systems (ICIS), Orlando, USA.
- Kankanhalli, A., C. Y., T. Bernard and K.K. Wie (2005). Contributing Knowledge to Electronic Knowledge Repositories: An Empirical Investigation. *MIS Quarterly*, 29 (1), 113-143.
- Laumann, E. O., P. M. Siegel and R. W. Hodge (1971). *The logic of social hierarchies*. 2nd edition. Markham Publishing Company, Chicago.
- McAfee, A. (2009). *Enterprise 2.0: New Collaborative Tools for Your Organization's Toughest Challenges*. McGraw-Hill Professional, Boston.
- Meske, C. and S. Stieglitz (2013). Adoption and Use of Social Media in Small and Medium-sized Enterprises. In Harmsen, F. and H. Proper, (Eds.). *Practice-Driven Research on Enterprise Transformation*, 61-75. *Lecture Notes in Business Information Processing*, 151, Springer, Berlin.
- Meyer, P. and J. Dibbern, (2010). An Exploratory Study about Microblogging Acceptance at Work. In Proceedings of Americas Conference on Information Systems (AMCIS), Paper 449, Lima, Peru.
- Musembwa, S. and S. Paul (2012). Social Networks: Cultural Diversity, Trust, Reciprocity and Social Capital. In Proceedings of Americas Conference on Information Systems (AMCIS), Paper 18, Seattle, USA.
- Nelson, R. E. (2001). On the shape of verbal networks in organizations. *Organization Studies*, 22, 797-823.
- Oberg, A. and P. Walgenbach (2008). Hierarchical structures of communication in a network organization. *Scandinavian Journal of Management*, 24, 183-198.
- Putzke, J., K. Fischbach and D. Schoder (2010). Power Structure and the Evolution of Social Networks in Massively Multiplayer Online Games. In Proceedings of the European Conference on Information Systems (ECIS), Paper 159, Pretoria, South Africa.
- Rank, O. N. (2008). Formal structures and informal networks: Structural analysis in organizations. *Scandinavian Journal of Management*, 24, 145-161.
- Richter, A. and K. Riemer (2013). The Contextual Nature Of Enterprise Social Networking: A Multi Case Study Comparison. In Proceedings of the European Conference on Information Systems (ECIS), Paper 94, Utrecht, Netherlands.
- Richter, D., K. Riemer and J. vom Brocke (2011). Internet Social Networking: Research State of the Art and Implications for Enterprise 2.0. *Business & Information Systems Engineering (BISE)*, 3(2), 89-101.
- Riemer, K., A. Altenhofen and A. Richter (2011). What are you doing? - Enterprise Microblogging Ascontext Building. In Proceedings of the European Conference on Information Systems (ECIS), Paper 252, Berlin, Germany.
- Riemer, K., P. Overfeld, P. Scifleet and A. Richter (2012). Eliciting the anatomy of technology Appropriation Processes: A Case Study in enterprise social media. In Proceedings of the 20th European Conference on Information Systems (ECIS), Barcelona , Spain, 13th June 2012. Paper 134.
- Riemer, K., A. Richter and M. Boehringer (2010). Enterprise Microblogging, *Business & Information Systems Engineering (BISE)*, 2(6), 391-394.
- Riemer, K. and P. Scifleet (2012). Enterprise Social Networking in Knowledge-intensive Work Practices: A Case Study in a Professional Service Firm. In Proceedings of the 23rd Australasian Conference on Information Systems ACIS 2012, Geelong, Australia, 5th December 2012.
- Schöndienst, V., H. Krasnova, O. Günther and D. Riehle (2011). Micro-Blogging Adoption in the Enterprise: An Empirical Analysis. In Proceedings of the 10th International Conference on Information Systems (ICIS), Zurich, Switzerland.
- Schwarz, G. M. (2006). Positioning hierarchy in enterprise system change. *New Technology, Work and Employment*, 21, 252-265.

- Scott, J. C. (1990). *Domination and the arts of resistance: Hidden transcripts*. New Haven, NY: Yale University Press.
- Sidanius, J., F. Pratto, C. Laar, S. van and Levin (2004). Social dominance theory: Its agenda and method. *Political Psychology*, 25, 845-880.
- Steinfeld, C., J. DiMicco, N. Ellison and C. Lampe (2009). Bowling Online: Social Networking and Social Capital Within the Organization. In *Proceedings of the 4th International Conference on Communities and Technologies (C&T)*, 245-254, New York, USA.
- Stieglitz, S., L. Dang-Xuan, A. Bruns and C. Neuberger (2014). Social Media Analytics: An Interdisciplinary Approach and Its Implications for Information Systems. *Business and Information Systems Engineering*, 6(2), 89-96.
- Stieglitz, S. and L. Dang-Xuan (2013). Emotions and Information Diffusion in Social Media – Sentiment of Microblogs and Sharing Behavior. *Journal of Management Information Systems*, 29 (4), 217-248.
- Stieglitz, S. and L. Dang-Xuan (2012). Impact and Diffusion of Sentiment in Political Communication – An Empirical Analysis of Political Weblogs. In *Proceedings of the 20th European Conference on Information Systems (ECIS)*, Paper 98, Atlanta, USA.
- Stocker, A., A. Richter, P. Hoefler and L. Tochtermann (2012). Exploring Appropriation of Enterprise Wikis: A Multiple-Case Study. *Journal of Computer Supported Cooperative Work*, 21 (2-3), 317-356.
- Suh, B., L. Hong, P. Pirolli and E. Chi (2010). Want to be Retweeted? Large Scale Analytics on Factors Impacting Retweet in Twitter Network. In *Proceedings of the IEEE Second International Conference on Social Computing*, 177-184.
- Tapscott, D. and A.D. Williams (2006). *Wikinomics: How Mass Collaboration Changes Everything*, Portfolio Trade.
- Ugbah, S. D. and S. Dewine (1989). New communication technologies: the impact on intra-organizational dynamics. *Information and Management*, 181-186.
- Venkatesh, V., M.G. Morris, G.B. Davis and F.D. Davis (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27 (3), 425-478.
- Weber, M. (1921/1980). *Wirtschaft und Gesellschaft*, 5, rev. edition. Tübingen: J. C. B. Mohr (Paul Siebeck).
- Williams, S. and P. Schubert (2011). An Empirical Study of Enterprise 2.0 in Context (2011). In *Proceedings of the BLED eConference*, Paper 44, Bled, Slovenia.
- Wu, Y. and W. Chang (2013). Network Diversity and Social Cohesion in Creative Performance: A View of Communication Media Mix. In *Proceedings of the 34th International Conference on Information Systems (ICIS)*, Paper 14, Milan, Italy.
- Zhang, J., J. Qu Yan and W. Yuling (2010). A Case Study of Micro-blogging in the Enterprise: Use, Value and Related Issues. In *Proceedings of the CHI conference*, Paper 1633, Atlanta, Georgia, USA.
- Zhao, D. and M. B. Rosson (2009). How and Why People Twitter: The Role that Micro-blogging Plays in Informal Communication at Work. In *Proceedings of the ACM international conference on Supporting group work (Group '09)*, 243-252, Sanibel Island, Florida, USA.
- Zorn, I. (2005). Do culture and technology interact? Overcoming technological barriers to intercultural communication in virtual communities. *SIGGROUP Bulletin*, 25 (2), 8-13.