

Social Media Information Benefits, Knowledge Management and Smart Organizations

Abstract. Social technologies can provide a potent means for organizations to manage their information flows and thus induce changes in their knowledge management (KM) systems, which can then be linked to performance improvements. This paper examines the growth of social media within organizations, considering the impact this may have upon knowledge sharing in a particular type of KM system - Community of Practice- (CoP) based discussion groups (KMDG). We focus on this KM tool because it provides employees with an opportunity to strategically reach out to different groups of people within their CoP, and engage in information exchange and communication. Using a content analysis method, we investigate two intermediate information mechanisms (information richness and informal communication) that social media KMDGs are theorized to generate, and quantify their effects on labor productivity and return on assets. Our findings provide evidence of KMDG positively affecting organizational performance through embedded information and social communication.

Keywords: Knowledge management; Information richness; Social media; Communities of practice; Discussion groups

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1. Introduction

The power of knowledge has become an important resource for organizations to develop expertise, solve problems, increase organizational learning, and initiate new situations for both the individual and the organization now and in the future (Bell, 1973; Grant, 1996). The amplified velocity and dynamic nature of the new economy, partnered by substantial advances in technology, has created an incentive for many organizations to reconcile and utilize their knowledge in order to generate value over a sustained period of time. The effective utilization of a firm's intangible assets has also functioned as a catalyst for creating a competitive advantage over other organizations operating in the market (Leal-Rodríguez, Roldán, Leal, & Ortega-Gutiérrez, 2013). Knowledge management (KM) is a discipline that promotes an integrated approach to identifying, capturing, evaluating, retrieving, and sharing all the enterprise's information assets included databases, documents and procedures, among others (Leal-Rodríguez et al., 2013). The speed by which knowledge management has become an integral business function for many organizations is astounding, as reflected in the way different KM systems have evolved over the years, including 'communities of practice' (Levine & Prietula, 2012). It is these barriers that influence the choice of a KM system to accomplish the access to and deployment of knowledge in different workplace contexts. As organizations must consider a wide variety of technical and human issues when choosing the 'right' mix of a KM system in order to lever knowledge effectively, the firm's energy, organizational activity, and investment can often result in ineffective KM initiatives. Becker (2002, p.1041) argues that the coordination of knowledge involves more than just identifying sources of knowledge, as the "dispersedness of knowledge is inextricably linked to the problem of designing communication structures." Corso, Martini, Pellegrini, Massa, and

Testa (2006) state that informal and formal channels, such as the intranet or corporate portals, should be employed to help access this knowledge. Against this background, we reflect on the recent surge of Internet-based technologies that have created a revolution in the way we communicate with each other. The proliferation of social media usage within society has permeated organizations both formally and informally. A range of technologies from blogs to social networks have extended the reach of the digital revolution to the organization, creating challenges and opportunities that are expected to be compounded over time as social media is further integrated into the organizational landscape.

Whilst previously seen as a platform for establishing a convenient link with friends and family across the world, today social media has grown beyond a space for just personalized interactions — it has transformed into a professional space running alongside the personal space (Gal, Jensen, & Lyytinen, 2014; Jeppesen & Fredricksen, 2006). Interestingly, communication and organizational specialists have also benefited from the opportunities this forum offers. They endeavor to exploit every bit of this space as an alternative path through which to connect with and thus reach out to individual employees, and sometimes even groups, and provide them with alternate — sometimes even more exciting — opportunities against conventional means to communicate and collaborate with each other. Social media is often defined along the lines of any website or application that enables users to engage in social networking activities such as creating, sharing or interacting with information (Piskorski, Eisenmann, Chen, & Feinstein, 2011). The surge in the development of the new technological platforms within the ‘social media’ space such as search engines, next-generation mobile communication devices and their correspondingly sophisticated interfaces, expanded person-to-person communication spectrums, and a plethora of the next generation of ‘online social networking’ platforms have all contributed to the construction of a much more encouraging and engaging space for organizations, affording

them improved and enhanced access to employee-generated content (Faraj, Jarvenpaa, & Majchrzak, 2011; Gal et al., 2014). These efforts usually complement how organizations strategize ways of leveraging knowing and learning (Aral, Brynjolfsson, & Van Alstyne, 2012).

In this paper, we examine the extent to which these social media knowledge and learning benefits affect organizational performance. The study focuses on one particular KM system, that is, communities of practice- (CoP) based discussion groups (DGs) (Thompson, 2005). We measure the degree to which CoP-based DGs can exploit the potential of social media and further develop the organization's knowledge base. CoP-based DGs can now benefit greatly from social media-based two-way communication channels that are much more effective and personal. Both the instantaneity of two-way social media communications and the directionality of CoP discussions make an organization's DGs an ideal candidate for investigating KM systems. Our conceptual framework essentially builds on the notion of two-way social media communications, where both employees and organizations gain from the new emerging technological landscape as when they engage in more frequent and direct communications. Consequently, employee-generated content amplifies the organizational knowledge base and, along with firm-generated content, it potentially creates opportunities for improvements in organizational performance. We further refine these knowledge exchange processes in terms of two new categories of information and knowledge management. If social media communication enables superior work outcomes by helping individuals build information-rich KM systems, it should also produce the same intermediate information benefits that a KM system is theorized to provide. We thus investigate the question of whether social media-induced knowledge management systems or KMDGs generate *information richness* and *informal and social communication*. Rather than assuming that KM systems can be understood as providing one type of information benefit, we

unbundle information and knowledge mechanisms into different types (i.e. information richness and informal communication). Consequently, we can not only quantify the actual benefits of both KM systems and technology, but also discern the more relevant type of information mechanism that affects organizational performance (Goh, Heng & Lin, 2013; Wu, 2013).

Our conceptualization of user-generated content-based KM systems as characterized by information richness and informal communication sheds light on the nature of evolving organizational technologies that draw on multi-sided communication platforms employed by different sets of users (e.g., employers-employees). We therefore fill an important research gap in the literature on social media and knowledge management systems as prior research has mainly focused on narrow classifications of knowledge and information transformation mechanisms (Baird & Parasnis, 2011). We define information richness as the heterogeneity of information content in an individual's posts on KMDG. Earlier access to a variety of information sources allows an individual to gather increasingly diverse information, which can be instrumental to productivity. Informal communication measures how much of an individual's communication is related to socializing and informal social activities. Guzman and Trivelato (2008, p.255) emphasize the importance of socialization, as "only through spending time together... can experience be shared." We then examine the extent to which social media-based information and knowledge mechanisms are positively related to organizational performance. Our findings will likely show that social media has the potential to transform and change existing organizational structures by making KMDGs an integral KM system that increases company knowledge. This transformation can have important economic consequences, such as improving worker productivity and firm profitability. We could then suggest that the growth of Internet-based high-competition markets means that

organizations can respond faster and are able to resolve more complex problems through social collaboration and knowledge sharing.

The paper is organized as follows. In the first section, research on knowledge management, social media and consumer-generated content is reviewed and amalgamated to piece together the bigger picture of the role and effects of communities of practice and discussion groups within an organization's knowledge management system. The following section provides a review of the study's methodology and introduces our data. We then present our research findings. In the final section, we examine the implications of our results for future research and discuss the study's limitations.

2. Research hypotheses

2.1. KM systems and information benefits

Our next question is what type of UGC social media do KMDGs produce? This question is pertinent because, as Fernandez (1991) contends, some information benefits may facilitate organizational processes and may even have competing performance implications. This means that it is important to measure and classify various types of information benefits in order to understand how they affect work and organizational outcomes (Goh et al., 2013; Wu, 2013). Similar arguments can be advanced in relation to a KM system because it was previously difficult to observe and classify the type of information generated by a DG. Old communication systems had limited ability to precisely capture the content of people's communications. Using social media tools, one can now record and process employee-generated information and use it to quantify various aspects of information benefits. Aral and van Alstyne's (2011) study of email traffic shows that brokers are more likely to deal with

heterogeneous information. KM systems are also likely to improve the knowledge content of human interactions that take place within a CoP. Chen and Xie (2008) identify how enormously diverse conversations can take place on social media. Consequently, it becomes important to fully understand the type of information that is being transferred between individuals inside an organization. In addition, social media-based KM systems may allow individuals to make social contacts with each other, thus increasing social communication within the system. There is a large body of marketing literature that treats informal and social communication different from other types of user-generated content (Chen & Xie, 2008). For example, social communication is distinct from information richness in that it captures the intensity of one type of information that helps build stronger personal relationships (Goh et al., 2013; Wu, 2013). In our present context, we can thus distinguish between *information richness* and *informal and social communication* as two distinct types of KMDG-generated information mechanisms. Such mechanisms are arguably vital in supporting KM systems for two clear reasons. Firstly, discussing issues raised within the official records, through social media mechanisms, helps people to understand the tacit dimensions of knowledge embedded within the records (Roberts, 2001). This is important for many organizations, as the parties may not be experts in some fields, yet they may need a good understanding of all perspectives to make commercially viable decisions. Secondly, it may be that such social media communications stimulate further knowledge-sharing among parties as relationships develop. Such observations demonstrate the importance of explicit knowledge-sharing considerations within a KM system. We therefore present our first set of hypotheses.

Hypothesis 1A. Social media KMDGs increase information richness within a KM system.

Hypothesis 1B. Social media KMDGs increase informal and social communication within a KM system.

2.2. Information richness

Social media KMDGs allow users to interact with a diverse group of people, with expertise across a range of different operational areas. Information gathered from these work-related interactions with colleagues and friends is the primary purpose that KMDGs can serve. Such serendipitous events may generate important research ideas, and help organizations get feedback and analyze users' interactions in order to improve their work processes and outcomes. Social media allows users to come together online and exchange, discuss, communicate and participate in various forms of social interaction. In addition, there may be some specific reasons for employees to engage in social media-based KMDG communication. These may consist of prior knowledge and experience, social ties, and learning and developmental goals (Dellarocas, 2003). For example, employees would often look for additional information when dealing with a new client, operating new technology, or adapting to a new organizational system. Furthermore, co-workers' judgments on these and other related matters can shed important light on workplace changes that happen quite frequently. Whereas KMDGs compensate for the inadequate knowledge and experience of some of the employees, they also provide opportunities for dialogue and information-sharing. Given that insufficient knowledge and experience is one of the motivations of employees to engage in social media, it is likely that a diverse range of topics will crop up in KMDGs. It is likely that the resulting communication will enable a KM system to generate superior return by various performance measures. Moreover, KM literature provides extensive arguments for why KM systems' informativeness may positively impact productivity (Adler, 2001; Fernandez, 1991; Wu, 2013). Such systems can be viewed within the framework of instrumental understanding as they generate task-related information and advice (Garicano &

Wu, 2012). We can therefore take information richness as a proxy for instrumental KMDG relationships. They are crucial to higher work performance through their effect on knowledge sharing. On the other hand, there is an issue of organizational control of employee-generated content (such as to prevent knowledge leakage); this is likely to affect knowledge generation in an organization. However, since the direction of the relationship between KM systems and organizational performance is still likely to be positive, we hypothesize the following.

Hypothesis 2. Information richness associated with KMDGs improves organizational performance measured as labor productivity.

2.3. Informal and social communication

Informal and social communication focuses on how much of an actor's communication is related to socializing and informal social activities, and thus it measures the intensity of one type of communication. Socializing informally with a diverse group of people opens the way for individual employees to learn about new expert developments and technology changes. They may even acquire both innovative and conventional solutions to everyday production problems (Goh et al., 2013; Wu, 2013). Not only can they get to know each other better through these socializing activities, but they can also develop a diverse circle of friends. It is important to consider the role of informal and social communication within the context of traditional KM system tools such as DGs. Second, social ties may lead online users to consider other people's opinions (Burke et al., 2011). The sense of belonging to the online community and altruism increases their awareness of other users. Social ties may encourage people to share their knowledge and expertise on the Internet (Chow & Chan, 2008); furthermore, Chen and Xie (2008) report that the desire for social interaction and the

concern for other users are some of the reasons for writing online reviews. In the present KMDG context, online users might share their views so as to develop their ability and persuasiveness, and they may also wish to enhance their prestige and self-image in the virtual community. Because of these motivations, employees are likely to be interested in interacting with and feeling part of such a community. Positive feelings are likely to encourage greater understanding of others' behaviors and opinions, and people may take these feelings into a team or group situation where collaboration is important. Informal and social communication may thus encourage team play and cooperation and, if more people can generate positive feelings about each other's skills and efforts, they would be more willing to contribute to such initiatives (Wu, 2013; Wu & Wang, 2006). We thus hypothesize that informal communication results in improved levels of organizational productivity. In light of this discussion, we suggest the following hypothesis.

Hypothesis 3. Informal and social communication associated with KMDGs improves organizational performance measured as labor productivity.

2.4. Complementarities between information richness and informal communication

Our current focus on knowledge, particularly for KM, is often explicitly oriented towards commercial effectiveness. However, some research claims that, in order to achieve the level of effective behavior required for competitive excellence, organizations must first overcome various social, human and cognitive barriers before considering the technological factors that enable effective knowledge sharing. It is not always possible to simply use technology to seed the development of a knowledge-sharing community (Brazelton & Gorrey, 2003). Thomas, Kellogg and Erickson (2001) recognize that organizational

knowledge is “inextricably bound up with human cognition, and the management of knowledge takes place within an intricately structured social context”. Hsu, Chen, Chiu and Ju (2007) suggest that strong levels of employee interaction are crucial for organizations to remain competitive, although a reliance on virtual knowledge sharing without necessary incentives could reduce the motivation to share expertise across the firm. An aspect of a social media KMDG is that it freely allows informal communication and helps with building personal relationships. It is in this context that information richness and informal communication may reinforce each other’s impact so as to take advantage of both types of information and knowledge benefits in achieving desired organizational outcomes. In this way, they could also overcome the constraints that hamper the use of knowledge-sharing technologies. To understand their joint effects on organizational outcomes, we examine how information richness and informal communication together affect organizational productivity. Information richness may help improve an individual’s work productivity, whereas informal and social communication can also play an important role in developing knowledge-based communities by enhancing interpersonal relationships (Garicano & Wu, 2012). Informal activities and sharing of information are essential for creating a context of trust and confidence (Dixon, 2000). Informal communication enables higher levels of collaborative performance both globally and locally and allows better decision making (Guzman & Trivelato, 2008). The notion of complementarity refers to a variety of effects (e.g., one variable reinforces the other; the effects are reciprocal; one variable moderates the other (Ichniowski & Shaw, 2003). In some situations, therefore, the relationship between information richness (the cognitive) and informal and social communication may not sit well in a community of practice context. From a CoP perspective, it is participation in social processes that is front and centre, involving a social process whereby a person travels from a

peripheral point to become a central member, and has nothing to do with information richness. Our hypothesis below also reflects these concerns.

Hypothesis 4. Information richness and informal and social communication complement each other to the extent that there are reciprocal benefits for their impact on organizational performance.

3. Empirical methods

3.1. Study context

Social media platforms now enable many features for observable, interpersonal communication, which one can easily quantify at the dyadic individual level and investigate their impact on economic and organizational measures of performance (Faraj et al., 2011; Hua & Haughton, 2012; Jeppesen & Fredricksen, 2006). These features mainly relate to the instantaneity of two-way communications and the consequent directionality of discussions that take place on these platforms. These developments have enormously improved the KMDGs' functionality. For example, previous studies highlighted the poor presentation of DGs and the difficulty in finding relevant information, even when they used online platforms such as company's intranet. Cluttered responses usually made it difficult to locate knowledge and tricky to access via these platforms. Ardiceivilli et al. (2003) suggested that a message board-type format would improve the DG display, providing a 'cleaner' interface within which to search for expertise. In such non-social media DG settings, all responses that impede discussion visibility are presented individually, and employees are forced to open individual responses separately. A social media DG platform, on the other hand, collates

responses under one title, making all inputs visible to the DG 'visitor'. Furthermore, it reduces the repetition of similar answers.

Posts and comments are usually the two content methods that KMDG users employ to interact with each other. Importantly, all such communication is two-way, which means that KMDG members share their experiences all the time, reaching an influential audience of colleagues, peers and consultants. KMDG members can download the application ('app') to their mobile phones and can read all communications sent out by the company to its employees. They can view other employees' posts and comments and make and post any comments in response. By engaging in a strong access strategy this potentially optimizes communications within the CoP and increases the efficiency in organizational communication channels. The app drives individuals to comment on and respond to new skill learning opportunities in specific CoP areas, thus building communities and relationships around them (see Hua and Haughton (2012) for other similar examples). Moreover, by successfully implementing this strategy the organization can gain employee insight on new policies and project ideas. The mobile/tablet app that we study here was new and proprietary and exclusively designed for the focal company, providing better 'out of office' access. The focal company is a global project management business which designs and implements large engineering projects and also helps other companies design, enable, manage and secure their project environments by using their process knowledge, technical expertise, and engineering capabilities. Previously, staff could access the company's Intranet from home via a computer or smart phone. This led to an increase in contributions from 'tech-savvy' employees who found the new technology more appealing. However, many others showed a reluctance to use the technology for their information needs. The alternative technology (the app) improved the longevity of DGs by adopting social media-specific elements, increasing the use among younger employees as well as older employees.

3.2. Content analysis

Content analysis is defined as “the systematic, objective, quantitative analysis of message characteristics” (Neuendorf, 2002, p.1). In our case, it is a quantitative analysis of the content of the KMDG posts and the responses. A common disadvantage of using content analysis is that the information needed is limited or incomplete. However, this disadvantage is overcome by analyzing social media posts because of the time-line nature of the KMDG app, which allows an app visitor to scroll back in time to the beginning of the KMDG page, gaining access to a vast amount of posts. We measure information richness and informal and social communication using these posts and comments in the KMDG app. Several studies have already employed electronic communication data to explore organizational problems (Wu, Huberman, Adamic, & Tyler, 2004). When analyzing the textual or qualitative data for quantitative analysis, it is common to use text mining techniques. The text mining tool first decomposes the textual content into words and phrases based in its large library. It then performs extraction of concepts, where the number of concepts can indicate the richness of information contained therein¹. Our measures of KMDG factors are directly derived from these text mining results. We measure information richness as the number of concepts extracted. By finding distinct topics in each person’s KMDG posts, we can capture the information heterogeneity across individuals. We also measure the frequency of social communications and informal activities in a person’s electronic posts. We define information richness as the heterogeneity of information content in an individual’s posts on KMDG, whereas social communication measures how much of an individual’s communication is related to socializing and informal social activities. How intense a certain type of information

— such as social communication — is can also be beneficial, particularly in situations where team and group work is important.

We take two distinct steps to classify LDA topics. In the first phase, we search the entire topic space using every document in a corpus so as to classify words into topics. We use this method to classify 75 topics using the entire corpus of electronic communications. Examples include topics such as ‘Research’, ‘Leading’, ‘Problem’, ‘Building’, and ‘Project’. We calculate information richness for each person in every month as the average cosine dissimilarity of the topic space in the person’s DG contributions. We then asked four employees who had extensive experience at the firm for many years to verify that the DG-based information exchanges revolve around these topics generally.

3.3. Control variables

To obtain robust estimates of the effect of focal UGC constructs, we control for potentially confounding factors at the individual employee level. Our control variables include individual employees’ demographics (age and gender), managerial roles, monthly income, and job ranks. Male is a dummy indicator for male gender (1: male, 0: female) and monthly income is the level of employee *i*’s monthly income (1: lowest, 5: highest). If the effect of UGC constructs on work and organizational outcomes indeed derives from individual employees’ demographics, the effect of UGC should disappear once differences in individual employees’ demographics are controlled for. We create a dummy variable for the managerial role indicating whether the person is a project manager. Job ranks take an ordinal value ranging from 5 to 10: level 5 is the junior manager and level 10 is a vice president. We have a dummy variable for each business division to control for the differences across various divisions. The other important aspect of UGC (employee-generated content) is the total

posting volume (volume at period t) and, to account for potential selection bias at the content generation level, we include an employee user's own posting volume (i.e. total volume of content generated by employee i in his/her CoP at period t).

We examine empirically whether the use of social media can induce performance improvements after controlling for seasonality, individual characteristics, and past performance.

$$\begin{aligned}
 Performance_{i,t} = & \alpha + \beta_1 volume_{i,t} + \beta_2 lab_product_{i,t} \\
 & + \beta_3 gender_i + \beta_4 age_i + \beta_5 mgr_i + \sum_w \beta_w income_w \\
 & + \sum_j \beta_j job_rank_j + \sum_d \beta_d division_d \\
 & + \sum_o \beta_o ownpost_o + \sum_t \beta_t month_t + \varepsilon_{i,t}
 \end{aligned} \tag{1}$$

This is followed by our examination of whether KMDGs generate the two types of information and knowledge benefits — i.e., information richness and informal communication — that we envisage as improving work and organizational performanceⁱⁱ. To carry out these investigations, we first estimate a fixed-effects (FE) model. Subsequently, we run a random-effects (RE) model to conduct the analysis of the relationships between a KM system's informativeness and information richness, a KM system's informativeness and social communication, and a KM system's informativeness and work and organizational performance. We measure organizational productivity using labor productivity as another performance measure, which we calculate as earnings before interest and taxes (EBIT) over total labor costs. The use of total labor costs as denominator allows us to account for variations among the firm's salary structure. We also use Return on Assets as a financial performance measure; this is calculated as net profit divided by revenues. We control for the differences in individual characteristics as individuals may have different propensities to engage in social media. We incorporate attributes such as gender, demographics and job roles that are likely to affect both information benefits and organizational performance.

Business organizations are coming to view knowledge as their most valuable and strategic resource. It is therefore vitally important for a firm to create an integrated knowledge infrastructure that is well regulated and supported by all. Engineering and consultancy companies operate in an industry where the speed of innovation determines the success of the company. As one industry reports suggests, “the average interaction worker spends an estimated 28 percent of the workweek managing e-mail and nearly 20 percent looking for internal information or tracking down colleagues who can help with specific tasks” (McKinsey, 2012). Social media has completely changed these patterns of communication in the workplace: a message now takes the form of ‘content’. Employees spend less time searching for task-related information, significantly reducing the time spent on a searchable record of knowledge. Knowledge sharing leads to better decision making as faster access to more experts or relevant documents increases the chance that better decisions are made. Consequently, workers are likely to seize any productivity improvement opportunity by accessing information expeditiously. Thus, if a social media platform is to produce informational benefits, it should also have a strong effect on organizational and worker productivity. Table 1 shows the summary statistics of managers’ demographics, job roles, and network characteristics.

[Insert Table 1 about here]

4. Results

We first examine whether the adoption of KMDG is correlated with organizational performance as specified in the reduced-form regression (see Appendix 1). As we find, KMDG is positively associated with organizational productivity, as measured by labor

productivity. The adoption of KMDG generates an additional \$126.27 in labor productivity ($\beta = 126.27, p < 0.01$), while we control for temporal shocks and individual fixed effects. The greater the ability of KMDG to improve a KM system's informativeness is, the greater its impact on organizational productivity is. In other words, with the mediating factor being the ability to improve the informativeness of the KM system, the use of social media has a significant positive impact on labor productivity and firm profitability. Social media is thus a relevant technological change that has the capacity to influence the internal organizational processes of an organization through its effect on the informativeness of a KM system. These changes are then linked to improvements in work and organizational outcomes.

[Insert Table 2 about here]

Our above findings suggest that social media enables superior organizational outcomes by helping individuals develop a more nuanced understanding of the company's goals, strategy, purposes and processes, as encapsulated in its KM system. Social media shapes a knowledge-based organizational architecture by helping build strong foundations for its KM systems. Columns 1 and 2 in Table 2 present the results. In each one of the regressions, dependent variables are centered to have a mean of 0 and a standard deviation of 1. As we find, the adoption of KMDG is positively correlated with information richness ($\beta = 0.539, p < 0.01$). As KMDG allows individuals to provide comments on individual posts, it encourages employees working in a CoP to acquire and share new knowledge (or information that they were not previously exposed to). Hence, the net effect of these changes is that the system generates increased levels of information richness. We find a similar trend in relation to informal communication ($\beta = 0.148, p < 0.05$). However, the coefficient estimate of informal communication is much smaller than the coefficient estimate of information

richness, suggesting that the operations of KMDGs are more strongly associated with generating information richness than informal communication is. Thus, we can plausibly claim that information richness is the primary benefit of hosting a KMDG. It is intuitive that the adoption of social media KM has a bigger effect on information richness than informal communication as the system is mainly intended to enhance the process of gathering and storing task-related information (Wu, 2013; Wu & Wang, 2006).

4.1. KM system informativeness

We now examine the extent to which a social media KM system produces the same intermediate information and knowledge benefits that an information-rich KM system is theorized to provide (Wu, 2013; Wu & Wang, 2006). Table 3 shows the relationships between an organization's KM system and information richness, and between an organization's KM system and informal communication. In general, KMDG is positively related to both information richness and informal communication. We first used a fixed-effect model, as shown in Column 1. As can be seen, KMDG is positively correlated with an increase in information richness ($\beta = 3.436, p < 0.01$). With regard to the RE model, as presented in Column 2, the outcome is not very different ($\beta = 5.625, p < 0.01$). Moreover, when using a fixed-effect model, having a more information rich KM system is positively correlated with an increase in social communication ($\beta = 0.148, p < 0.01$). With the other estimation approach (RE model), the effect continues to be positive ($\beta = 0.337, p < 0.05$). These results establish the proposition that an information-rich KM system have both types of information benefits, supporting Hypotheses 1A and 1B. As can be seen, these counter-intuitive results emphasize the need for having both work and social elements in a KM system.

[Insert Table 3 about here]

4.2. Information benefits and organizational performance

Our results thus far suggest that both information richness and informal communication constitute important components of an information-rich KM system. We now investigate the effects of information richness and informal communication on labor productivity. Table 4 presents the results. We use normal controls (i.e. demographics, job ranks, ownpost, and business divisions) in all regressions. In Column 1, we find a positive relationship between information richness and labor productivity ($\beta = 0.257, p < 0.5$). Hypothesis 2 is confirmed. Per the result presented in Column 2, informal communication is also positively correlated with labor productivity ($\beta = 0.114, p < 0.5$), supporting Hypothesis 3. When both information richness and informal communication are jointly used in the model, we find a similar association (see Column 3). As we find, the interaction effect of information richness and informal communication is positive and statistically significant ($\beta = 0.148, p < 0.01$), indicating a plausible complementary relationship. Hypothesis 4 is thus supported. This is a counter-intuitive result as it is generally believed that social communication in the workplace results in higher monitoring cost. More important, this result drives interesting insights into the effect of introducing social media-type technologies in the workplace.

The results of the effects of information richness and informal communication on productivity, as measured by return on assets, are presented in Table 5. Both information richness and informal communication are centered to have a mean of 0 and a standard deviation of 1. This allows us to directly compare the two information benefits. As we find,

information richness has positive relationship with the firm's profitability ratio (see Column 1). However, as the coefficient estimate in Column 2 shows, the same is not true with informal communication as it is not statistically significantly correlated with firm profitability. We further show that information richness is positively correlated with firm profitability when treating both information richness and informal communication as independent variables in the same model (Column 3). These results show that the informativeness of a KM system enabled by social media can generate both information richness and informal communication, although they differ in terms of their individual effects (Goh et al., 2013; Wu, 2013; Wu & Wang, 2006). To examine the question of whether information richness and social communication are complements in how they affect organizational productivity, we add the interaction between information richness and informal communication in the model. As we find, there is a positive interaction effect, although only statistically significant at the $p < 0.1$ level (see Column 4).

[Insert Tables 4 and 5 about here]

5. Conclusion

Knowledge management is theorized to provide information benefits, as it builds on the informational nature of the knowledge economy (Bell, 1973). Many large companies must maintain the effective transfer of knowledge across divisions and regions in order to remain competitive in their markets that increasingly rely on the rapid dissemination of intangible assets. Naturally, knowledge is dispersed throughout an organization, leading to knowledge asymmetries between people (Becker, 2002). The coordination of knowledge is

therefore important; this enables appropriate knowledge to be sourced, supporting the execution of organizational tasks. However, this process requires the design of appropriate communication structures (Becker, 2002). This study examines the factors that affect and contribute toward an effective strategy for generating tangible KM-based employee engagement through social media. Corporate social media can provide information and knowledge benefits by enhancing the capacity of individuals to share and communicate critical personal and business information on their desktop and remotely (Chow & Chan, 2008). Our study is significant because it reassesses the role of KM as a social media-based information-sharing system and sheds light on how organizations can use social media system tools such as KMDGs as mechanisms for creating a long-term competitive advantage.

Building on prior research (Goh et al., 2013; Wu, 2013), we theoretically examine social media KM by conceptualizing two particular types of information and knowledge benefits that characterize a KMDG system — information richness and informal communication. Our study of UGC in this manner brings to the fore the idea that KMDG contents affect organizational performance through embedded information and informal and social communication. The study focuses on using virtual discussion groups and investigates how information and knowledge benefits generated by these groups overcome the technical and human barriers of sharing knowledge through KMDGs. As we find, KMDGs are successful at facilitating knowledge sharing within the organization. We also examine whether these KMDG outcomes affect organizational performance and, if so, which is most effective – information richness or informal and social communication. We thus provide specific results on the degree to which hosting a social media tool within an organization can change a knowledge management system over time, and whether there are any economic benefits associated with such a change. Our findings show that engagement in social media conversations carried out on KMDGs leads to a positive increase in organizational

performance. We also establish the general information and knowledge benefits of using KMDGs, particularly the role of informal and social communication in KMDG system tools. It will be interesting to discover whether the social media-induced information and knowledge benefits found in this research are demonstrated in similar studies on other KM systems. As we show, KMDGs represent a feasible step that can be taken to construct an enhanced knowledge-sharing environment.

Our findings have important managerial implications. Wu and Wang's (2006) research argues that system use had no significant positive effect on user-perceived KM system benefits. However, our results illustrate that discussion groups offer multi-faceted advantages, primarily acknowledging the technical benefits associated with discussion groups. That is, there are significant information richness benefits generated by the organizations' DGs (e.g., DGs can enable 'quicker problem solving' or provide 'best-practices'). Social benefits (e.g., 'better communication' and 'camaraderie with peers' across the group) are recognized as well, although the technical benefits outweigh the social benefits. These results emphasize that social media KM systems facilitate knowledge sharing, but it is a collaborative organizational culture that enables it to be exploited. Knowledge sharing through social technologies leads to more visible recognition (Garicano & Wu, 2012). When people share their knowledge, this increases the feeling of connection to the company and helps develop a performance culture based on trust and confidence. However, as discussed above, it is also important to acknowledge that an increased knowledge base cannot necessarily be directly linked to organizational benefits. There can be situations where teams create knowledge (output) without a resulting improvement in performance (outcome).

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Table 1
Summary statistics

Variable	Mean	Std. dev.	Min	Max	Obs
Volume (posts)	63.594	58.473	0.000	138.000	19,234
Ownpost	0.023	0.094	0.000	9.000	19,234
Return on Assets	0.034	0.042	0.013	0.055	19,234
Labor Productivity	17.367	11.928	9.874	26.427	19,234
Gender(0- male)	0.165	0.274	0.000	1.000	19,234
Age	31.398	5.647	21.445	63.274	19,234
Managers	0.173	0.289	0.000	1.000	19,234
Income	2.684	0.736	1.000	5.000	19,234
Job ranks	6.594	1.376	4.000	11.000	19,234

Table 2
Effects of KMDG adoption on firm profitability, labor productivity, information richness and informal communication

	(1)	(2)
	Information richness (standardized)	Informal communication (standardized)
KMDG adoption	0.539*** (0.267)	0.148** (0.047)

Income	0.235 (0.006)	0.725 (0.017)
Gender	-0.187 (0.018)	-0.469 (0.052)
Age	-0.783 (0.056)	-0.528 (0.034)
Managers	0.195 (0.014)	0.396 (0.145)
Job ranks	0.126 (0.025)	0.248 (0.032)
Work divisions	0.327 (0.182)	0.163 (0.017)
Ownpost	0.184 (0.112)	0.195 (0.043)
Individual fixed effect	Yes	Yes
Month dummies	Yes	Yes
Observations	19,234	19,234

Clustered standard error. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3

Relationships among social media KM, information richness and informal communication

(1)	(2)	(3)	(4)
Information	Information	Informal	Informal

	richness	richness	communication	communication
	FE	RE	FE	RE
Volume (posts)	3.436*** (1.274)	5.625*** (2.257)	0.148*** (0.109)	0.337** (0.164)
Income	0.278 (0.113)	0.184 (0.165)	0.196 (0.142)	0.243 (0.182)
Gender	0.135 (0.121)	0.249 (0.145)	0.263 (0.134)	0.364 (0.124)
Age	0.282 (0.143)	-0.173 (0.158)	0.289 (0.197)	0.258 (0.243)
Managers	0.267 (0.174)	0.251 (0.228)	0.271 (0.223)	0.131 (0.086)
Job ranks	0.001 (0.000)	0.273 (0.143)	0.165 (0.134)	0.271 (0.165)
Work divisions	0.052 (0.016)	0.176 (0.134)	0.343 (0.268)	0.178 (0.123)
Ownpost	0.354 (0.198)	0.278 (0.223)	0.187 (0.145)	0.143 (0.168)
Observations	15,582	15,582	18,753	18,753
R-squared	0.035	-	0.058	-
Number of people	1,767	1,767	1,767	1,767

Clustered standard error. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4

Social media KM and labor productivity

	(1)	(2)	(3)	(4)
	Labor productivity	Labor productivity	Labor productivity	Labor productivity
	FE	IV	FE	IV
Information richness	0.257** (0.135)		0.234** (0.103)	0.209** (0.117)
Informal communication		0.114** (0.066)	0.123* (0.075)	0.156* (0.093)
Information richness x Informal communication				0.148*** (0.027)
Income				0.529 (0.344)
Gender				0.026 (0.015)
Age				0.431 (0.183)
Managers				0.387 (0.212)
Job ranks				0.229 (0.165)
Work divisions				0.229 (0.165)

Ownpost				0.321 (0.224)
Observations	19,234	19,234	19,234	19,234
Number of people	1,767	1,767	1,767	1,767

Clustered standard error. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5

Social media KM and financial performance

	(1)	(2)	(3)	(4)
	Return on Assets	Return on Assets	Return on Assets	Return on Assets
	FE	FE	FE	FE
Information richness (standardized)	0.176*** (0.016)		0.137*** (0.023)	0.137** (0.098)
Informal communication (standardized)		0.138 (0.119)	0.147* (0.112)	0.134. (0.125)
Information richness x Informal communication				0.183* (0.123)
Income		.		0.264

				(0.244)
Gender				0.486
				(0.327)
Age				0.294
				(0.243)
Managers				0.262
				(0.227)
Job ranks				0.425
				(0.343)
Work divisions				0.139
				(0.125)
Ownpost				0.183
				(0.162)
Observations	19,234	19,234	19,234	19,234
Number of people	1,767	1,767	1,767	1,767

Clustered standard error. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix 1

Effects of KMDG adoption on firm profitability, labor productivity, information richness and informal communication

	(1)	(2)
	Labor productivity	Firm profitability
KMDG adoption	126.274***	0.372**

	(119.137)	(0.184)
Income	0.483	0.274
	(0.016)	(0.118)
Gender	-0.247	0.068
	(0.007)	(0.052)
Age	-0.396	0.285
	(0.032)	(0.224)
Managers	0.260	0.137
	(0.021)	(0.115)
Job ranks	0.001	0.173
	(0.000)	(0.164)
Work divisions	0.053	0.328
	(0.007)	(0.267)
Ownpost	0.254	0.281
	(0.135)	(0.226)
Individual fixed effect	No	Yes
Month dummies	No	Yes
Observations	19,234	19,234

Clustered standard error. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Footnotes

ⁱ Marketing researchers have earlier operationalized information richness as the number of concepts (e.g., price, quality) communicated by advertisements (e.g., Healey and Kassarian 1983).

ⁱⁱ However, taking information heterogeneity as representing information richness may be risky; too much information/knowledge heterogeneity, without appropriate integration mechanisms, may cause chaos rather than generate information richness.