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Social Media Facilitated Group Performance: An Investigation of Tie Strength in Grouping

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Abstract: The wide adoption of social media has encouraged university teachers to consider employing social media as a new e-learning platform. This research aims to find the role of social media usage in promoting effective communication and enhancing group task performance. What is more, to give implications on a better grouping method, we utilized the concept of tie strength (in a typical social network) in the current research. We proposed that the tie strength among university students negatively moderates the relationship between social media usage and communication. The social constructivism theory was employed as a major theoretical foundation, built on which a research model was developed. The model was tested via 135 senior-year undergraduates in one of the diversified classes. The data analysis results revealed that social media usage promotes communication in group; tie strength in the social network group negatively influences group communication. This means, contrary to our natural assumption, the closer the relationship is among group members, the less likely communication would happen in the group. Our research gave implications on pedagogy in that it extended our understanding of the project-based learning in small teams supported by interactions via social media. It also contributed to the grouping strategies of the classes that rely heavily on the group discussion via social media.

Keywords: Social media, communication, tie strength, group task performance

1. Introduction

The usage of social media is becoming an effective tool in the process of teaching and learning and has increasingly improved the quality of learning outcomes in higher education. Social media are low-cost and low-barrier tools for both students and teachers. From the students' perspective, a considerable proportion of the university students are "digital natives", who become frequent users of social media to personalize content and share/participate online (Prensky, 2001). When social media are introduced to the classroom (by digital natives), they become an informal platform to facilitate learning. From the educator's perspective, social media is contributing towards a disruptive change in pedagogy, known as Pedagogy 2.0 (McLoughlin and Lee, 2011). Pedagogy 2.0 is a framework to achieve learning outcomes by exploiting the potential of Web 2.0 technology. It emphasizes on collaboration, personalization, and user-generated content. Due to the advent of Pedagogy 2.0, instructions in the classroom are moving from the traditional "teacher-centered" approach to the "student-centered" approach (Farkas, 2012). Due to the increasing importance of the pedagogic shift derived from the massive adoption of social media, it is important to explore the consequences of social media in pedagogy.

One of the notable features of social media is their ability to assist communication by real-time information exchange. In the educational context, the increase in communication and interaction is most likely to be attributable to the use of web technology (Andersen, 2004). Social media as a computer-mediated communication platform are expected to promote online connections, maintain relationships and boost communication between students. For example, Ioana (2013) argued that social networking sites like Facebook responds well to the particularities and requirements of the student-centered approach, where students are encouraged to create and develop their own learning style. They further help to promote peer communication, collaboration and active learning among the students. Besides supporting communication, social media as a pedagogic tool can also influence team or task performance in Education.

Tie strength in the social network influences the quality and level of communication (Gilbert and Karahalios, 2009), it is therefore necessary to consider the impact of social tie in the present research. The concept of tie strength was first introduced by Granovetter (1973) when examining the strength of interpersonal ties in the social network. He defined the strength of a tie as "a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie" (Granovetter, 1973, p.1361). Acquaintances and friends with loose relationship are weak ties while trusted friends and family are strong ties. Studies have shown that weak-tie social networks are more effective than strong-tie social networks for sharing information and enhancing social activities (Granovetter, 1973; Levin and Cross, 2004). The primary reason is that people with strong ties (due to their homogeneity) have too many overlaps which reduce the need to communicate; while people with weak ties may have a better chance to acquire and synthesize diverse pieces of information through interactions (Granovetter, 1973). Research has shown that weak ties can help friends to generate creative ideas via communication (Burt, 2004).

Granovetter (1973) originally developed the theory of tie strength, and it has been a useful framework for explaining various social support phenomena such as computer-mediated support groups, virtual community support, and support networks within organizations (Wright and Miller, 2010). Computer-mediated networks are a particularly useful resource for connecting to weak ties who are usually not physically close in a face-to-face relationship (Walther and Boyd, 2002). The emphasis of the weak tie relationship is especially meaningful in the online social networking context, since weak ties could facilitate in receiving different viewpoints, reducing risks, accessing to objective feedbacks from others, and minimizing role obligations (Wright, 2012). From a pedagogic view, studying tie strength within the group is also meaningful, since it could become a new grouping strategy for university teachers to consider before assigning online group works.

To sum up, this paper focuses on addressing two important research questions: does the usage of social media influence communication among group members and their task performance; and does tie strength moderate the relationship between social media usage and communication.

2. Literature Review

2.1 Social Media and Communication

Researchers have extensively studied the effect of social media application on students' communication and collaboration (Hung and Yuen, 2010; Yaros, 2012). Neier and Zayer (2015) illustrated that students were willing to use social media in education due to the nature of the increased interactivity, which was proven to be a primary motive of social media usage by digital natives (Yaros, 2012). Greenhow and Robelia (2009) demonstrated that the usage of social media could enhance relational support and maintenance and encourage self-presentation. Ellison (2008) also depicted social media as a "social lubricant", which provides a cost-efficient way for self-presentation and broadcasts personal events to promote interaction and connections (compared with face-to-face interactions). Similarly, Vural (2015) believed that social media, with the ability to contact multiple people instantly, can better notify students of announcements, and facilitate communication, discussion and self-evaluation. Social media are also expected to facilitate communication between students and instructors (Sturgeon and Walker, 2009).

2.2 Social Media and Task Performance

Social media also have a significant effect on task performance. Junco et al. (2011) observed that although two groups of the students had similar high school GPA, the group with Twitter usage in class demonstrated higher engagement and more increase in GPA. In addition, through a study on German students, Skiera et al. (2015) discovered that students located in densely connected subnetworks earn better grades, and this is especially true for male students. Social media can also improve students' academic performance though enhancing communication, facilitating student engagement and collaboration (Faizi at al., 2013). The positive relationship between social media usage and academic performance has also been proved by the following studies: Isidore (2016) and Lusk (2010).

Nevertheless, there are also opposite views among scholars that believe social media usage is negatively related to the academic performance (Michikyan et al., 2015). For example, Huang (2014) directly mentioned that social media addiction and its symptoms had a significant negative impact on adolescents' academic performance and social capital. San Miguel (2009) found out that the GPAs of Facebook users were typically lower than those of the non-users. Choney (2010) further illustrated that the usage of social media is a major reason for distraction that impairs students' academic performance. Using social media for study purposes involves multitasking which undermines students' capacity to process information and engage in deeper learning (Wood et al. 2012). What is more, Walsh et al., (2013) reported that students who spent the most time using social media had fewer academic behaviors (e.g., completing homework and attending class), a lower academic confidence and more problems affecting their school work. Besides the negative effect of social media, there is also a proportion of the studies that suggest no relationship between students' social media usage and the academic performance for general purposes (e.g., Junco, 2015; Lambić, 2016). To clarify the ambiguity in the literature, the present study proposed a positive relationship between the two, and empirically tested it in survey.

2.3 Tie Strength

As social media enable students to communicate online in their social networks and social tie is a crucial factor in the social networks, it is necessary to consider the tie strength when investigating the effect of social media usage. In general, people with strong ties are emotionally interdependent and typically provide trust and emotional support to each other. Strong ties were also said to be more effective in tackling complicated projects (Hansen, 1999) and form teams for information dissemination (Shi et al., 2007). Compared with strong ties, weak ties are the individuals that are less emotionally attached. They function as the "bridges" that connect different social circles, support information diffusion and provide access to diverse source of information (Granovetter, 1973). Although strong ties tend to provide more emotional support, the information overlap due to the gravitation towards homogeneity limits the inflow of different viewpoints (Botwin et al., 1997). In contrast, weak ties could enhance the creativity by providing non-redundant information and more complexed information processing behaviors (Perry-Smith, 2014). In the online social network, as mentioned before, weak ties are more likely to provide objective feedback and innovative ideas while the same ability is restricted by strong ties due to the interdependent nature of the relationships (Wright, 2012). Due to the above, weak ties could also facilitate cooperation (Melamed and Simpson, 2016) and knowledge creation (Wang, 2016).

2.4 Grouping Method

In higher education, the group project as an assessment mode is becoming popular, it is necessary to explore the approaches to form better groups and achieve better academic results. Over the years, there has been a sufficient discussion or debate on the right grouping strategy, especially in the setting of the primary school or secondary school. For example, the debate on the ability-based grouping (Magnus, 2016), which classifies the students based on their level of ability or achievement (this includes the sub-categories of Homogeneous and Heterogeneous grouping) (LeTendre et al., 2003); and the age-based (Elizabeth, 2015) or gender-based (Lentillon-Kaestner and Patelli, 2016) grouping, which groups the students based on age or gender differences. For the within-class grouping method (Lou et al., 1996), the literature has suggested grouping students based on ability, gender and friendship (Blatchford et al., 2001). There has been a relatively rare discussion on how the university students should be grouped, especially in the new social environment (the group discussion via social media) and based on the criteria of social ties. As social interaction and relationship building among group members are very important to a successful academic result, the factor of tie strength should be considered before assigning group works to the students. In pedagogy, there has been a limited and/or indirect discussion on the effect of social ties (e.g., centrality and peer effect).

Prior research has investigated the effect of social media and social ties in the educational context. However, there are still gaps in the extant literature: 1. although many studies have examined the effect of social media usage, most of such studies focused on the process aspect of social media usage, e.g.,

engagement, collaboration, and communication (Hung and Yuen, 2010; Faizi, et al., 2013). Few attentions were paid to the study of the social media's impact on the academic outcomes (e.g., task performance, learning outcomes, grade, etc.) (Mingle and Adams, 2015); 2. there is an ambiguity on the exact nature (positive/negative/no correlation) of the relationship between social media usage and students' academic performance; 3. there is a scarcity of the studies on the effect of the tie strength when investigating students' behavior of social media usage; 4. prior research have studied the relationship between face-to-face communication or online communication and students' performance, few of them have investigated the relationship under the social media context. In view of these, the present research intends to investigate the effect of social media on not only the social process (communication), but also the direct academic performance of the students. We would further introduce the concept of tie strength as a moderator in the relationship between social media usage and communication.

3. Theoretical Foundation-Social Constructivism Theory

Unlike other learning theories that focus solely on how individuals construct knowledge (Piaget, 1953), social constructivism emphasizes the factor of social interaction (Vygotsky, 1978) while learning. In recent years, there has been an emerging trend of constructivism research focusing on the role of social technologies and social media in facilitating the generation of socially constructed knowledge (e.g., Mbati, 2013; Gaytan, 2013). The application of social media in teaching is likely to generate the learning conditions suggested by the social constructivism theory. In other words, social constructivism delineates the importance of social interaction in knowledge construction and social media can help create a social environment depicted by the social constructivism theory. In the present study, social constructivism theory provides necessary theoretical support to the hypotheses development between social media usage and its consequences (communication and task performance).

4. Research Model and Hypotheses

Based on the above discussions of the literature review and the theoretical foundation, we present the research hypotheses and model in Figure 1.

H1: Social media usage is positively related to communication in group

H2: Communication in group is positively related to the perceived task performance

H3: Social media usage is positively related to the perceived task performance

H4: Tie strength negatively moderates the effect of social media usage on communication in group, so that a higher level of tie strength is associated with a lower level of communication, whereas a lower level of tie strength is associated with a higher level of communication.

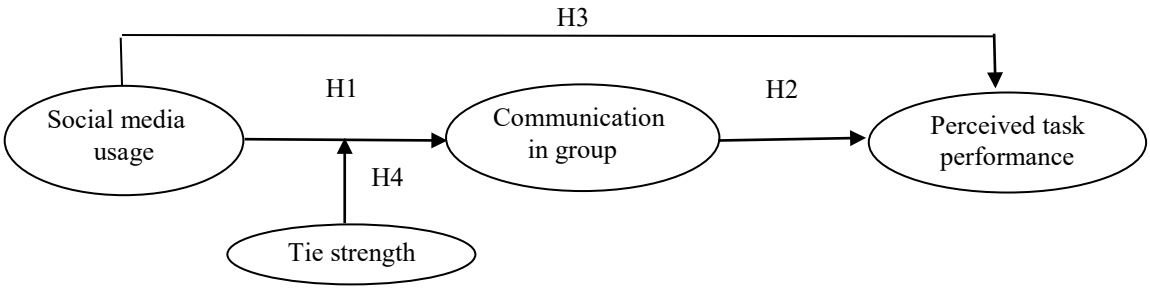


Figure 1. Research model

5. Data Collection and Design

The survey instruments were developed based on the literature review and the formal discussions with faculty members who have used social media as teaching and learning tools in their classes. We use 22 items (with 5-point Likert scale) to measure the four constructs in the research model. Social media

usage is defined as the frequency for people to perform social interaction and information exchange on the social networking sites (Hughes, et al., 2012). The students were expected to answer how frequent do they use social media in general to finish the tasks. We used ten items from Lowry, et al. (2006) to measure the communication within the groups (e.g., after using social media, our group communication is appropriate.). Tie strength is used to assess the level of closeness of the relationship between the group members. This research borrowed the (five) questions from Gilber and Karahalios (2009), which was among the first to map the social media data with the concept of tie strength (e.g., I have a strong relationship with most of my group members). Perceived group task performance measures the effectiveness of completing the group project as perceived by the group members. We collected the group members' self-reported perception of their group project grade in the survey.

Data were collected from one of global strategic management courses in Hong Kong. At the beginning of the semester, the lecturer asked the students to form into a group of five to six people by themselves. Each group was requested to create a Facebook group and invite the subject lecturer to join their groups. Facebook was employed as the official learning platform for students to learn and for teachers to assess their learning outcomes. Through Facebook group, students were required to discuss their projects, respond to group members' comments and share or upload audio, video, music, or files related to the project (nevertheless, the students could also use other communication tools for informal discussions). They would then deliver a final project report based on the communication via the Facebook platform. The final report would be assessed by the format of a group presentation. The lecturer, on the other hand, served as facilitator and monitored the process by providing feedback, answering questions, and assessing milestones that had been established to ensure groups were on the right track throughout the semester. In the last teaching week of the semester, the predesigned questionnaires were distributed to 150 students in three classes of the subject. After the data cleansing, 135 completed questionnaires were used for the final data analysis.

6. Data Analysis

6.1 Measurement Model

Partial least squares (PLS) structural equation analysis was used to test the measurement and the structural model. SmartPLS (v. 3.2.4), as a mature and widely used PLS software, was employed to test the research model. Table 1. shows that all the composite reliability values are greater than the accepted value (0.70) (Fornell and Larcker, 1981) and the square roots of the Average Variance Extracted (AVE) are more than the recommended threshold (0.5) (Hair et al., 1998). These results demonstrated a good reliability, consistency and convergence of the constructs. Table 2 shows the loadings and cross loadings of the indicators, which confirms the discriminant and convergent validity of the constructs.

Table 1: Composite reliability.

Constructs	No. of items	Composite reliability	Square root of AVE
Social media usage	4	0.82	0.73
Communication	8	0.93	0.79
Tie strength	5	0.81	0.68
Task performance	2	0.90	0.90

Table 2: Loading and cross loadings of the indicators.

	Social media usage	Communication	Tie strength	Task performance
SMU_1	**0.666**	0.200	0.006	0.124
SMU_2	**0.896**	0.462	-0.095	0.332
SMU_3	**0.696**	0.242	-0.068	0.162
SMU_4	**0.631**	0.239	-0.080	0.131
COMM_1	0.374	**0.822**	0.198	0.389
COMM _2	0.325	**0.875**	0.288	0.466
COMM _3	0.336	**0.816**	0.118	0.422
COMM _4	0.288	**0.828**	0.151	0.347
COMM _5	0.437	**0.848**	0.147	0.357
COMM _6	0.385	**0.744**	0.184	0.358
COMM _8	0.193	**0.633**	0.224	0.325
COMM _9	0.315	**0.682**	0.178	0.251
TS_1	-0.075	0.224	**0.751**	0.155
TS_2	-0.191	0.021	**0.497**	0.162
TS_3	-0.127	0.173	**0.741**	0.196
TS_4	-0.032	0.136	**0.675**	0.237
TS_5	0.014	0.140	**0.711**	0.207
TP_1	0.333	0.449	0.219	**0.922**
TP_2	0.175	0.396	0.270	**0.883**

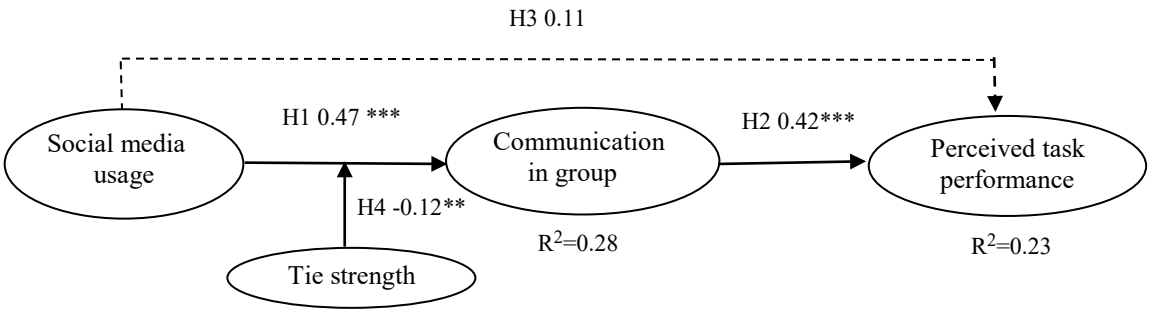
Notes: SMU=Social Media Usage; COMM= Communication; TS=Tie Strength; TP=Task Performance

6.2 Structural Model

Table 3 presents the results of path coefficients in the research model. 3 out of 4 hypotheses are significant. The path coefficients of H1 (between social media usage and communication) and H2 (between communication and task performance) are significant at 0.01 level, and H4 (between the interaction effect and communication) are significant at 0.05 level. No significant path was found between social media usage and task performance. As for the R-square (shown in Figure 2), the values for the two important dependent variables in the structural model are 0.28 and 0.23 respectively. This means social media usage and the interaction of social media usage and tie strength contribute to 28% of the variance in communication in group; and all the independent variables together explain 23% of the variance in the perceived task performance.

Table 3: Path coefficients.

Paths	Path coefficient	T-statistics	Significant?
H1: Social media usage → Communication	0.47	6.06	Yes (0.01 level)
H2: Communication → Task performance	0.42	4.68	Yes (0.01 level)
H3: Social media usage → Task performance	0.11	1.30	No
H4: Interaction effect → Communication	-0.12	2.20	Yes (0.05 level)



Notes: The solid line means the path coefficient is significant; dotted line means not significant.
** p<0.05; *** p<0.01

Figure 2. Results of PLS analysis

7. Discussion

The data analysis results provided support for most of our hypotheses in the research model. First, the results indicate that social media usage is a significant predictor of communication in group. This result is consistent with the prior pedagogic research that social media assist in students' communication (Hung & Yuen, 2010), increase the interactivity within groups (Yaros, 2012), foster a sense of communication community (Vural, 2015) and enhance relational support and self-presentation (Greenhow & Robelia, 2009). In addition, this relationship was proved to be well-supported by the social constructivism theory which emphasizes the critical role of the social environment in students' learning process. Second, students' communication via social media was found to positively influence the perceived group task performance. This means the more communication made among the group members, the better the group will perceive about the outcome of their group work. This result is in line with the literature on communication in general (e.g., Pöysä-Tarhonen, et al., 2016) and communication in the social media context in particular. Third, contrary to our hypothesis, social media does not directly influence students' perceived task performance as a group. The data analysis results showed no significant relationship between social media usage and perceived group task performance. This result is consistent with a smaller portion of the past research (e.g., Junco, 2015; Lambić, 2016) that there is no significant difference in grades between the frequent social media users and non-frequent social media users for general purposes. What is more, the result is also not upheld by the theory of social constructivism, which promotes a positive role of social media in students' learning. One possible explanation could be: students may use social media tools for the purposes other than achieving serious academic goals. In other words, the sole use of social media may not affect students' academic performance, but "how" students use them will. If the students use social media for engaging or information-retentive purposes, the use itself can lead to an enhanced level of perceived task performance (Wang et al., 2012). Last, our results provide some evidence that tie strength among the group members will negatively moderate the effect of social media usage on communication in group. This means social media's impact on communication in group will be stronger when group members have weak ties with each other. This result is consistent with Granovetter (1973) and Perry-Smith (2014)'s prediction, and demonstrates/reconfirms the power of weak ties in the group-based social networking environment, and in the educational field in particular.

8. Theoretical and Pedagogic Implications

First, it is among the few studies that simultaneously investigated the effect of social media usage on students' learning process and learning outcome. Second, the general social media usage among students will not necessarily lead to the enhanced task performance. This result indicates that the effectiveness of using social media in education depends largely on the way (e.g. via a serious and high quality of communication) and the objective of using them. Third, prior studies discussed intensively on

the role of communication in promoting online and offline group work; however, few of them examined the nature of communication among group members in the social media context. Fourth, this research applied the concept of tie strength to the educational field. It is among the first to emphasize the role of tie strength, especially the weak ties in the communication process. This research brings a new perspective to computer-supported collaborative learning by considering the relational closeness of the students. Last, the social constructivism theory was employed as the theoretical foundation. The social constructivism theory has a long history in the educational field; however, the application of the theory under the social media context is relatively new (e.g., Gaytan, 2013). The present study confirms the explanatory power of social constructivism theory in social media's effect on communication in group. For the pedagogic implications, this research extended our understanding of the project-based learning in small teams that was conducted online and supported by interactions via social media. Specifically, it contributes to the grouping strategies of the classes that rely heavily on the online group discussions via social media. When forming project groups, besides the homogeneous or heterogeneous considerations (Lou, Abrami, Spence, Poulsen, Chambers, & d'Appollonia, 1996), educators should also consider the relationships between the students.

9. Limitations and Future Research

First, the cross-sectional nature of the survey could only capture a snapshot of the research issues at a given point in time, but could not depict the evolutionary process of some important constructs (e.g., tie strength and communication in group) in the research model. We would suggest employing the longitudinal research design with data collected over multiple periods. Second, the cross-sectional survey is prone to the common method bias due to the single informants of the survey. Further research should obtain multiple types or sources of data points to avoid the common method bias. Third, since the phenomenon somehow involved group-level of the concepts (e.g., communication in group and perceived task performance), we suggest future research advance the research model at the group level and conduct multi-level data analysis to examine the relationships among the constructs across levels. Fourth, though we have tried to diversify the background of the students in the class, it would be ideal to study the tie strength in the business or broader social environment where respondents may have a real physical distance, diversified personalities, characteristics, nationalities and relationships, and rely heavily on the social media to collaborate with each other. The current research design restricts the scope of studying tie strength into a smaller group of the students who most likely have already known each other. Last, for the practical consideration, this study only tested the causal relationships with one type of the social media tools (Facebook), further studies should consider testing the same model with other famous social media platforms (e.g., google plus) to re-confirm the research results.

10. Conclusions

This study seeks to contribute to the growing body of research by proposing a framework for evaluating the effectiveness of social media usage among college students and the influence of the tie strength in students' group communication. The research results corroborated the findings of the past research that social media usage significantly influence the communication effectiveness and communication in group affects the perceived group task performance. A major contribution of this study lies in the moderating effect of the tie strength. The results provide educators with new insights on the usefulness of social media in pedagogy, as well as the way of assigning students into different project groups based on the closeness of the relationships in the social network.

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