

# “GOOD THINGS COME IN LIGHTWEIGHTS”: A GROUP DECISION-MAKING ANALYSIS COMPARING TWITTER ON MOBILE COMMUNICATION DEVICES TO COMPUTER-MEDIATED COMMUNICATION

*Completed Research Paper*

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## **Abstract**

*This paper reports on a study of the effects of Twitter-enabled mobile communication devices on group decision-making and group dynamics. One hundred and sixty-seven university students formed 44 groups under two distinct communication conditions: Twitter operating on mobile communication devices (TMCD), and Google Groups online message boards (OMB) accessed through personal computers. Each group was tracked as it completed an assigned set of group decision-making tasks. The study's results are analyzed through media synchronicity theory and its distinction between conveyance and convergence communication processes. TMCD exhibited significantly fewer conflicting (unfriendly) messages and a greater number of initiatory messages than OMB. Moreover, with tasks involving convergence communication processes, TMCD achieved significantly higher levels of conformity and satisfaction than OMB. These results imply that lightweight, portable mobile communication devices (MCDs), enabled with Twitter or another similar interface, complement conventional computer-mediated communication, offering an effective means of group decision-making.*

**Keywords:** Twitter, mobile communication, group decision-making, computer-mediated communication

## **Introduction**

In recent years, data usage with mobile communication devices (MCDs) such as the iPhone and the Android phone has surged dramatically. In general, one would expect voice conversation to be an easier and more convenient form of communication than text messaging, but reports from the industry paint a different picture (Elmer-DeWitt 2010; Wortham 2010). The Telecommunications Industry Association reports that MCD data usage grew an astonishing 400% between 2006 and 2010. Over the same period, voice usage rose a mere 5% (TIA 2010).

The exponential growth in data usage has been driven in part by the emergence of popular social media (Kaplan et al. 2010; Qualman 2010). Social media offer a mode of communication that is unparalleled in its capabilities and historically unprecedented. While traditional asynchronous media broadcast from the one to the many, synchronous social media allow many users to exchange news and views directly with many others. The user is transformed from a passive receiver to an active creator of content. Social media's user-friendly functions and portability foster human interactions and meaningful social encounters.

Social media use began with personal networks but has now reached organizational, industrial, national, and even international scales (Hughes et al. 2009; Rhoads 2011; Wagstaff 2011). One demonstration of the pervasive role of social media in twenty-first-century culture has been the new para-journalism (or ambient journalism), in which social media users report on breaking news before professional journalists do (Kwak et al. 2010). Recent events in the Middle East show that para-journalism is emerging as a major journalistic form and has significant effects on mass media and traditional journalism (Craig 2011; Farhi 2009; Hermida 2010).

Social media are also moving into business enterprise technologies (Baker 2010; Günther et al. 2009; Oracle 2010). Many business organizations are starting to incorporate social media in their business operations and communications. Used alongside computer-mediated communication (CMC), social media accessed through MCDs bring a greater flexibility to location-specific tasks and time-sensitive environments. This complimentary pair also contributes significantly to the growth of electronic commerce (Miller 2009). The leading social media marketing organization, Groupon ([www.groupon.com](http://www.groupon.com)), grew by over 2,000% between 2009 and 2010, from \$30.8 million to \$713.4 million in revenues (Wall Street Journal, 2011). We expect this growth trend in social media to continue and to affect personal, organizational, and commercial domains in coming years.

In the research community, only a few descriptive and expository studies of social media using MCDs have emerged (Chen 2011; Choi et al. 2010; Java et al. 2007; Krishnamurthy et al. 2008; Meyer et al. 2010; Zhao et al. 2009). These studies have focused primarily on Twitter, a popular micro-blogging medium that limits posts to 140 characters. This brevity permits frequent message exchanges that in some respects resemble online chatting. Twitter is used primarily for status notification and live reporting. Although Twitter can be accessed through personal computers, it is mostly used with MCDs.

Users around the world are employing social media and MCDs in group decision-making. This study explores the capacities of Twitter used on MCDs (TMCD) as a group decision-making tool. We aim to study how people using TMCD interact while accomplishing a decision-making task, and to discern how such interactions differ from those observed with conventional CMC. The study undertakes the following tasks: description and analysis of exchanged TMCD and online message board (OMB) messages; comparison of message frequency and type between TMCD and OMB; and analysis through media synchronicity theory (MST) (Dennis et al. 2008) of the fit between task type and communication process with TMCD.

## Theoretical Foundation and Hypothesis Development

### *Literature Review*

Previous studies of CMC have yielded valuable findings. A majority were published in the 1980's and 90's as CMC was joining face-to-face transaction as a major business communication mode. Collectively these studies suggest that the following variables play a role in group decision-making: member familiarity, member attributes, member interaction, time given, anonymous identity, gender, task type, communication mode, number of meetings, social influence, relevant background, and conflicts (Adams et al. 2005; Campbell et al. 2006; Gouran et al. 2003; Hollingshead et al. 1993; Kerr et al. 2004; Li 2007; Luppici 2007; McGrath 1984; Naude et al. 2000; Orlitzky et al. 2001; Sager et al. 2006; Strauss et al. 1994). Group decision-making is a complex, multi-layered process influenced by myriad variables and conditions.

The present study focuses on two variables: task type and communication mode. Regarding the former, McGrath (1984) presents four major task quadrants, each with two distinct sub-task types: generate (planning and creativity), choose (intellective and decision-making), negotiate (cognitive-conflict and mixed-motive), and execute (contest/competitive and performance/psychomotor). He finds that, faced with different tasks and task requirements, groups exhibit different levels of performance and respond with different behaviors and interactions.

As to the latter, communication is mediated in diverse ways, from face-to-face interaction to email, online message boards, real-time chat, group decision-support systems, electronic meeting system tools, and synchronous terminal-to-terminal transactions. These different media influence the process and outcomes of communication in a variety of ways.

Strauss and McGrath focused on task type and communication mode in a study of 72 three-person same-sex groups of undergraduate students (Strauss et al. 1994). They employed two communication modes—CMC and face-to-face—and three different task types: idea-generation, intellection, and judgment. They found a significant difference in productivity between the two media; participants' reactions also suggested a close relationship and interaction between communication mode and task type. In other words, different communication modes may be optimal for different task types.

Hollingshead, et al. (1993) studied group task-performance and communication technology. Like Strauss and McGrath, they tested CMC against face-to-face interaction, assigning participants creative, intellective, decision-making, and negotiation tasks. They found that team performance was significantly affected by the newness of the CMC technology, and that the face-to-face group showed superior performance in intellective and negotiation tasks.

McLeod and Liker (McLeod et al. 1992) assigned creative and judgmental tasks in a study of electronic meeting systems involving 34 four- or five-person groups of students. The CMC group exhibited more task-related and fewer socio-emotional comments, and showed better performance on the intellective task, but poorer performance on (and less satisfaction with) the judgmental task.

Collectively, these and other relevant studies of CMC imply a substantive causal relationship between task type and communication mode. Though TMCD is being actively researched in the field, we have been unable to locate completed decision-making studies of TMCD, because of the newness of these social media.

### ***Media Synchronicity Theory and Twitter on MCD***

Our theoretical foundation relies on a leading CMC model, media synchronicity theory (MST) (Dennis et al. 2008), which defines media synchronicity as "the extent to which the capabilities of a communication medium enable individuals to achieve synchronicity." MST posits two communication processes: *conveyance*, the delivery of content, and *convergence*, the formation of shared understandings about content. Conveyance, which involves the transmission of large amounts of information and its subsequent, retrospective analysis, is an asynchronous mode of communication. Convergence, the transmission of a smaller

amount of abstract data, and the concurrent clarification and negotiation of that data, is a more synchronous communication mode.

These two processes are supported and influenced by two media capabilities: *transmission capabilities* (transmission velocity, parallelism, and symbol sets) and *processing capabilities* (symbol sets, rehearability, and reprocessability). These capabilities allow users to evaluate a communication medium in a specific and detailed manner. Dennis et al. (2008) compare the transmission and processing capability of a range of available media. We expect that TMCD will closely resemble the near-synchronous mode of instant messaging and the fully synchronous mode of electronic conferencing.

This study focuses on Twitter's conveyance and convergence capabilities. MST holds that "communication performance comes from the matching of media capabilities to the communication processes required to accomplish a task, not to the overall task itself." Twitter offers a distinctive set of communication processes, including tweet, retweet, reply, direct message, following, hashtag, and third-party applications.

The portability of TMCD adds another dimension, one that touches on the "Eureka Effect" (Perkins 2000), in which a person suddenly and unexpectedly discovers a solution to a pressing problem when mentally "free"—while taking a shower, say, or strolling through a park, or sitting quietly in a café. This sort of "breakthrough thinking" has an identifiable physiological component: according to Jung-Beeman et al. (2004), just before the Eureka Effect, "the scalp electroencephalogram recordings reveal a sudden burst of high-frequency (gamma-band) neural activity." A person grappling with a problem that involves cognitive conflict may repeat this process over several cycles, walking away from the problem, as it were, and then re-approaching it from another angle. When a group is at work on such a problem, at the moment that part of the solution occurs to one individual, TMCD allows discussion to occur immediately, and for the problem-solving activity to continue. We therefore posit that TMCD will offer a better platform than OMB for some sorts of group decision-making tasks.

## ***Hypotheses***

Based on the MST characteristics of both media, we foresee TMCD would show greater synchronicity than conventional CMC. A conventional CMC environment imposes delays between one person's communications and others' responses. Although delays are also observable with MCDs, the portability of the device typically allows more rapid responses—so much more rapid that communication approaches the instantaneity of face-to-face exchange. Consequently, this would entail a higher level of satisfaction.

Negotiation and decision-making tasks require more discussion and idea exchange among group members. In the context of TMCD, increased exchange is expected to manifest as more original or initiatory tweets, retweets, replies, and direct messages, a higher level of group interaction and continuity, and hence higher group productivity. Combined with the portability function's "Eureka Effect," the frequency and high number of original or initiatory tweets should also create a favorable environment for the convergence processes described by MST.

The increasing personalization and customization of MCDs may also have significant effects. Today's iPhone and Android phones, with their numerous applications, are readily adaptable to personal preferences—features that make for a more seamless interaction between user and phone, and that may incline a person to perceive the group process using TMCD in a positive light. These considerations yield the following hypotheses:

**H1:** *TMCD will elicit significantly more messages than OMB.*

**H2:** *TMCD will elicit significantly fewer conflicting or unfriendly messages than OMB.*

**H3:** *TMCD will elicit significantly more initiatory messages than OMB.*

**H4:** *TMCD will be significantly more suited than OMB to convergence communication processes.*

**H5:** *TMCD will bring significantly greater satisfaction than OMB.*

**H6:** *TMCD will bring significantly greater satisfaction than OMB with convergence communication processes.*

## Research Methodology

### Experimental Design

Participants were first evaluated to assess their experience and fluency with Twitter and MCDs. They were divided accordingly into two groups: a TMCD group, whose participants owned an iPhone, Android phone, or another similar phone, and who used Twitter, and an OMB group, containing all other participants.

The experiments were conducted twice in Korea and once in the U.S. A total of 167 university students were divided among 44 groups: 33 four-person groups, 10 three-person groups, and one five-person group. (The four-person group was the target size, but a few participants withdrew from the experiment midway through.) Table 1 summarizes group distributions. The 'messages coded' numbers are lower than the 'subjects' numbers, because some subjects in teams were dropped and not counted due to lack of discussions and message content (e.g. in many cases only 2-3 messages were posted).

	Experiment I						Experiment II			Total
	Korea			U.S.			Korea			
	OMB	TMCD	Total	OMB	TMCD	Total	OMB	TMCD	Total	
Subjects	24	15	39	38	46	84	22	22	44	167
Teams	6	4	10	10	12	22	6	6	12	44
Messages coded	24	8	32	27	36	63	14	14	28	123
Questionnaire	23	9	32	23	18	41	N/A			73

The experiment facilitator checked and confirmed each Twitter ID and forwarded the assigned TMCD group number and the group members' IDs to each member. Every effort was made to ensure anonymity: users had access only to each other's' IDs, and no communication medium was allowed outside TMCD. Similarly, for the OMB groups, the facilitator checked and confirmed each OMB ID and forwarded the assigned OMB group number and group members' IDs to each member. The members were anonymous to each other except for their IDs. The OMB used was Google Groups (<http://groups.google.com>); its ease of use and full set of features made it an ideal CMC for this study.

Table 2 lists the tasks. The first three tasks are case studies from an Information Systems textbook (Rainer et al. 2010). The fourth and sixth tasks (University Ethics Committee and Nobel Industries) were adopted from previous empirical studies (Choi 2004; Strauss et al. 1994). The fifth task (McDonald's) is a Harvard Business Review case (Roberto, 2003);

In the first round, each task was assigned to at least one TMCD group and one OMB group. Based on the first round result, the fourth, fifth, and sixth tasks were determined to be appropriate in respect to the convergence vs. conveyance category. Hence in the second round, the fourth task was assigned to five TMCD groups and seven OMB groups, the fifth task to seven TMCD groups and six OMB groups, and

sixth task to seven TMCD groups and six OMB groups. A ten-day timeframe was given for each task. Groups were directed to actively discuss the topic and arrive within ten days at a final consensus and solution.

No.	Task Name	Task Description	Task Type	Communication Process
1	Zappos	Describes how Zappos uses Twitter for business gain. Asks group to assess Twitter's impact as an e-commerce tool.	Intellectual	Conveyance
2	RFID	Presents an RFID application to large events. Asks group to develop another RFID application.	Intellectual	Conveyance
3	Starbucks	Presents the Starbucks "third place" marketing strategy. Asks group to assess how in-store Wi-Fi affects this strategy.	Intellectual	Conveyance
4	University Ethics Committee	Presents an ethics case in which a student athlete bribes a college instructor to receive a grade change. Asks group to decide appropriate disciplinary actions.	Decision-making	Conveyance
5	McDonald's	Asks group to solve the given problems and build strategies for McDonald's.	Decision-making	Convergence
6	Noble Industries	Presents a situation in which a number of employees must be laid off. Asks group to decide by ranking employees.	Decision-making	Convergence

## Data Analysis and Discussion

### *Analysis of the Messages (Content Analysis)*

Every effort was made to ensure full data collection. With the TMCD groups, we identified and collected all tweets, retweets, direct messages, and replies. With the OMB groups, we retained all posted messages and replies. For the purposes of descriptive data analysis, we coded and counted the messages and words per category (Table 3). TMCD yielded more messages (though not to a statistically significant degree) and fewer words (likely because of Twitter's 140-character maximum).

Groups		Total		Average*	
		Words	Messages	Words	Messages
Communication Mode	TMCD	9590	357	532.8	19.83
	OMB	20552	229	1041.1	11.55
Task Type	Zappos	2430	50	1215.0	38.5
	RFID	1194	30	597.0	19.0
	Starbucks	1177	14	588.5	18.0
	Ethics	7251	129	578.5	15.0
	McDonald's	10,420	148	1302.5	22.9
	Noble	7670	215	697.3	23.2

\*per group

Looking at averages, the Zappos task elicited the most messages per group (38.5), the Ethics task the fewest (15.0); the McDonald’s task elicited the most words (10,420), the Ethics task again the fewest (7251). The Noble Industries task—a decision-making, convergence process task—shows relatively high values in both word and message counts. This may reflect of the more complex decision-making demanded by task itself, in comparison to the McDonald’s and Ethics tasks.

In the absence of precedent studies, message coding posed a challenge. While we continue to investigate the merits of different coding processes, in this study we have classified each message along three dimensions: *task specifics*, *friendliness*, and *agreement*.

- *Task specifics*: Each message was classified into one of three sub-categories:
  - An *initiatory message* is a task-specific message initiated by a group member, e.g., “Harry should be next I agree and then Tom and Phil.”
  - A *process-related message* is a task-specific message that checks for or clarifies information about the group process, e.g., “so what’s the next step for this project?”
  - A *non-task specific message* is not connected to the assigned task, e.g., “The guy sitting next to me on the train has a tattoo of a tear drop falling from his eye. How lil wayne of him.”
- *Friendliness*: Whether or not a message presents, explicitly or implicitly, a friendly tone, e.g., a smiley-face emoticon, or “how do we do that. lol sorry I’m awful at twitter.” Each message was classified as friendly, neutral, or unfriendly.
- *Agreement*: The extent to which a message supports or agrees with other message(s), e.g., “Harry should be next, I agree, and then Tom and Phil.” Each message was classified as agreeing, neutral, or disagreeing.

Each message was coded along each dimension. For instance, the message just quoted would be an agreeing, process-oriented message, neutral with regard to friendliness. Four judges conducted the coding. Several pilot coding sessions were held before the main coding in order to bring inter-judge reliability above 0.9. In the pilot sessions, judges coded a sample team’s messages and resolved differences through discussions. A total of five pilot sessions were conducted; inter-judge reliability values in the final round were between 0.94 and 0.99. The results of the actual coding are presented in Table 4.

Message Types		TMCD	OMB
Friendliness	Unfriendly	0.9	0.0
	Neutral	15.6	9.6
	Friendly	3.4	3.1
Task specifics	initiatory	9.6	6.9
	Process-related	5.6	4.6
	Non-task specific	4.3	0.9
Agreement	Agreeing	2.7	1.6
	Neutral	16.8	10.4
	Disagreeing	0.3	0.5

Among task specifics, the sub-categories *original* and *non-task specific* stand out. We find an average of 9.6 original messages with TMCD, an average of 6.9 with OMB: an average of 4.3 non-task specific messages with TMCD, and an average of 0.9 with OMB. This finding supports H2: *TMCD will elicit significantly fewer conflicting or unfriendly messages than OMB*. We believe that, by virtue of the ease of use

and portability of MCDs, as well as the Eureka effect described above, TMCD fosters more initiatory messages or original contributions and a friendlier atmosphere than OMB.

A normality check (Fields 2009) was performed with the data set to confirm validity. Because the results did not pass the check, a natural log transformation was performed. General Linear Model (GLM) analyses were then carried out on the data set. The independent variables were communication mode and task. We controlled two variables: group member number (because some groups had three or five members, this was set as a co-variant) and cultural difference (because the data spanned two countries with two different cultures, this was set as a control variable).

Table 5 shows that TMCD elicited significantly more initiatory messages ( $F = 3.5, p < 0.1$ ). This result supports H3: *TMCD will elicit significantly more initiatory messages than OMB*. This finding implies a positive correlation between generation of new ideas and TMCD use. We also find that TMCD elicited significantly fewer disagreeing messages ( $F = 6.2, p < 0.05$ ), a finding that supports H2: *TMCD will elicit significantly fewer conflicting or unfriendly messages than OMB*.

<b>Dependent Variables</b>	<b>Independent Variables</b>	<b>F-values</b>	<b>Notes</b>
Number of initiatory messages	Communication mode Type of task (six tasks) Mode*Task	3.5* 1.2 2.0	<ul style="list-style-type: none"> <li>• TMCD elicited significantly more initiatory messages.</li> </ul>
Number of agreeing messages	Communication mode Type of task (six tasks) Mode*Task	0.0 2.8* 3.8*	<ul style="list-style-type: none"> <li>• TMCD elicited more agreeing messages for the McDonald's task, while OMB elicited more for the Zappos task.</li> </ul>
Number of disagreeing messages	Communication mode Type of task (six tasks) Mode*Task	6.2** 2.4* 5.0**	<ul style="list-style-type: none"> <li>• TMCD elicited significantly fewer disagreeing messages than OMB.</li> <li>• The McDonald's task elicited significantly more disagreeing messages than any other task.</li> </ul>

\* significant at  $\alpha = 0.1$     \*\*significant at  $\alpha = 0.05$

The two process types posited by MST, convergence and conveyance, are analyzed in Table 6 in terms of three tasks: McDonald's and Nobel Industries (convergence) and Ethics (conveyance). The other three tasks were not included in the analysis because of the small sample sizes. TMCD elicited fewer words than OMB ( $F = 7.5, p < 0.1$ ), and convergence process tasks elicited more words than the conveyance process task ( $F = 3.5, p < 0.1$ )—a finding that accords with the physical attributes of TMCD and the attributes of convergence process tasks.

In the other sub-categories, we find significant interaction effects (high F-values) between communication mode (TMCD or OMB) and communication process (convergence or conveyance). TMCD had more neutral (in friendliness) messages, more initiatory messages, more process messages, more agreeing messages, more neutral (in agreement) messages, and more disagreeing messages in the convergence tasks than in the conveyance task. Two dependent variables had main effects: number of words and number of agreeing messages. TMCD elicited fewer words than OMB, and the convergence tasks elicited more words than the conveyance task. The convergence tasks also showed more agreeing messages than the conveyance task. These findings support H4: *TMCD will be significantly more suited than OMB to the convergence communication process*. On this basis, we speculate that the lightweight, portable, user-friendly interface of MCDs allows people to initiate and engage in ad hoc communication more easily than with OMB, facilitating group interaction and increasing communication frequency and group productivity.



**Table 6. Analysis Results on Convergence vs. Conveyance**

Dependent Variables	Independent Variables	F-values	Notes
Number of words	Communication mode MST's two processes Mode*Task	7.5* 3.5* 0.3	<ul style="list-style-type: none"> <li>• TMCD elicited fewer words than OMB.</li> <li>• The convergence tasks elicited more words than the conveyance task.</li> </ul>
Number of neutral (neither hostile nor friendly) messages	Communication mode MST's two processes Mode*Task	0.3 0.2 8.7**	<ul style="list-style-type: none"> <li>• TMCD elicited more words for the convergence tasks, OMB more words for the conveyance task.</li> </ul>
Number of initiatory messages	Communication mode MST's two processes Mode*Task	0.0 0.2 5.0**	<ul style="list-style-type: none"> <li>• TMCD elicited more original messages for the convergence tasks, OMB more original messages for the conveyance task.</li> </ul>
Number of Process messages	Communication mode MST's two processes Mode*Task	0.0 0.6 4.8**	<ul style="list-style-type: none"> <li>• TMCD elicited more process messages for the convergence tasks, OMB more process messages for the conveyance task.</li> </ul>
Number of agreeing messages	Communication mode MST's two processes Mode*Task	0.5 3.9* 3.6*	<ul style="list-style-type: none"> <li>• The convergence tasks elicited more agreeing messages than the conveyance task.</li> <li>• TMCD elicited more agreeing messages for the convergence tasks, OMB more agreeing messages for the conveyance task.</li> </ul>
Number of neutral (neither agreeing or disagreeing) messages	Communication mode MST's two processes Mode*Task	0.3 0.3 5.3**	<ul style="list-style-type: none"> <li>• TMCD elicited more neutral messages for the convergence tasks, OMB more neutral messages for the conveyance task.</li> </ul>
Number of disagreeing messages	Communication mode MST's two processes Mode*Task	0.5 0.1 3.6*	<ul style="list-style-type: none"> <li>• TMCD elicited more disagreeing messages for the convergence tasks, OMB more disagreeing messages for the conveyance task.</li> </ul>

\*significant at  $\alpha=0.1$  \*\*significant at  $\alpha=0.05$

### ***Analysis of Post-Experiment Questionnaire***

To learn more about the range of user experiences, we implemented a post-task questionnaire designed to measure levels of satisfaction with communication and outcomes, conflict, and team cohesiveness. The measurement constructs and items are adopted from prior studies (Chidambaram, 1996; Choi, 2004; Majchrzak et al., 2005; Pornsakulvanich et al., 2008). To ensure instrument validity and reliability, we performed factor analyses using the Principle Component and VARIMAX methods. Items with factor loading values below 0.5 were removed (Fields, 2009).

The finalized constructs and items, their corresponding Cronbach's alpha values, and t-test results are reported in Table 7. The factor scores of the five constructs were used as dependent variables in the subsequent analyses (Tables 7 and 8). As in the content analysis, the McDonald's and Noble Industries tasks were classified as convergence process tasks, the Ethics task as the conveyance process task.

**Table 7. Factor Analysis Results**

Factors (Constructs)	Items	Cronbach's $\alpha$	t-test (Communication Mode)	t-test (MST's two processes)
Perceived communication quality	<ul style="list-style-type: none"> <li>- The text messages to and from members were poorly written (reverse).</li> <li>- The text messages to and from members lacked critical pieces of information (reverse).</li> <li>- The text messages to and from members were hard to understand (reverse).</li> </ul>	0.84	p = 0.92	convergence = -0.10 conveyance = 0.45 p = 0.08
Satisfaction with communication	<ul style="list-style-type: none"> <li>- I was satisfied with the timeliness with which I received information from other group members.</li> <li>- I felt frustrated that I could not talk face-to-face with others (reverse).</li> </ul>	0.73	TMCD = -0.25 OMB = 0.31 p = 0.02	p = 0.12
Satisfaction with outcome	<ul style="list-style-type: none"> <li>- I believe that our work (output) was done correctly.</li> <li>- I believe that the decision my group made was of high quality.</li> <li>- Members of my group were able to use their expertise to their fullest potential in carrying out the task.</li> <li>- Members of my group helped and supported one another as best they could.</li> </ul>	0.86	p = 0.67	convergence = 0.14 conveyance = -0.38 p = 0.04
Group conflict	<ul style="list-style-type: none"> <li>- My group members and I disagreed frequently in reaching a decision.</li> <li>- There were times when I was withdrawn (or maybe upset) because of disagreements among my group's members.</li> <li>- One group member insisted on doing things his/her way and/or did not collaborate</li> </ul>	0.73	p = 0.20	p = 0.78
Group cohesiveness	<ul style="list-style-type: none"> <li>- Some group members did not contribute as much as they should have to the completion of the task, and this caused conflict in the group.</li> <li>- There was a lack of group unity and spirit and evidence of cliques and political maneuvering.</li> </ul>	0.71	p = 0.63	convergence = 0.28 conveyance = -0.78 p = 0.00

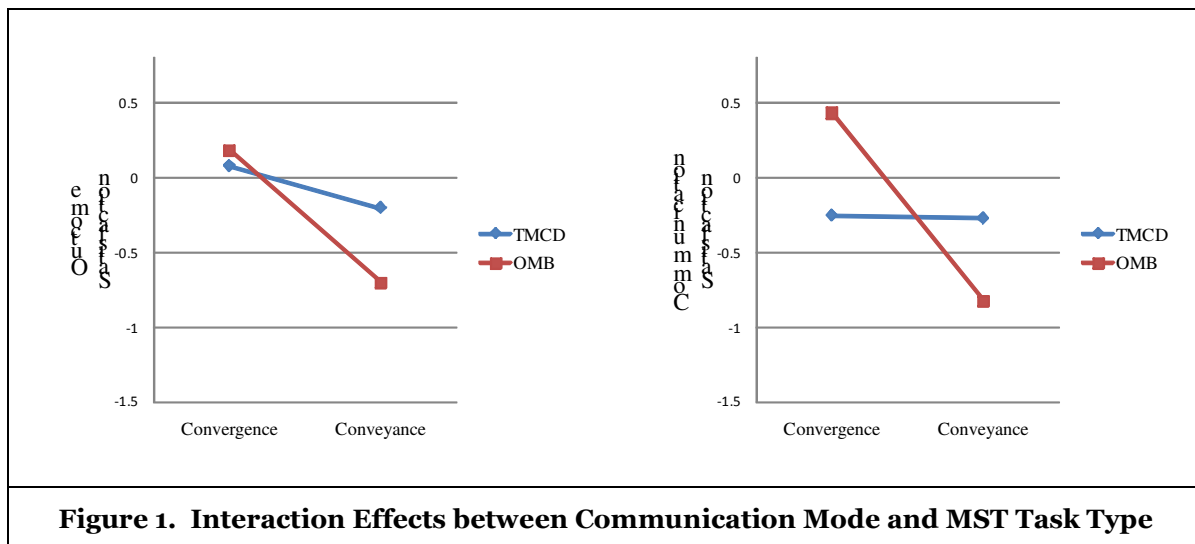
Simple t-tests were conducted on the finalized constructs (Table 7). Only satisfaction with communication showed a significant difference between OMB and TMCD: the latter showed a significantly less satisfaction. This finding contradicts H5: *TMCD will bring significantly greater satisfaction than OMB.*

We have three significant findings with respect to MST's communication processes. First, the convergence tasks showed significantly lower perceived communication quality than the conveyance task. MST defines a convergence process as a "discussion of preprocessed information about each individual's interpretation of a situation." In this situation, one person must be able to attend to another's lengthy argument or explanation, as both the McDonald's and the Noble Industries tasks required. Twitter's 140-character limitation may have forced participants to use a number of tweets to convey a single message. As MST theory states, "when individuals have large differences in their individual understanding, convergence may require as much or more cognitive processing as conveyance." Second, the convergence task exhibited a significantly higher satisfaction with outcome than the conveyance task. Finally, the convergence task exhibited significantly greater group cohesiveness than the conveyance task.

To test for interaction effects among independent variables, we employed the general linear model (GLM). The two main independent variables were communication mode (TMCD vs. OMB) and communication process task type (conveyance vs. convergence). Again the cultural variable (Korea vs. US) was controlled. Table 8 and Figure 1 show that communication mode and communication process task types have significant interaction effects on satisfaction with communication and satisfaction with outcome. However, no significant difference was found in satisfaction with communication between the convergence and conveyance tasks with TMCD—a finding that differs from the t-test results. The discrepancy may be an artifact of the control of other variables in the GLM analysis. Finally, satisfaction with communication using OMB drops significantly when the OMB is used for convergence rather than conveyance process tasks.

Dependent Variables	Independent Variables	F-values	Notes
Communication satisfaction	Communication mode MST's two processes Mode*Task	0.0 2.5 3.3*	• OMB exhibited a significantly greater difference in communication satisfaction between convergence and conveyance tasks (0.43 vs. -0.83) than TMCD did (-0.25 vs. -0.27).
Outcome satisfaction	Communication mode MST's two processes Mode*Task	1.3 0.1 0.3*	• OMB exhibited a significantly greater difference in outcome satisfaction between convergence and conveyance tasks (0.18 vs. -0.70) than TMCD did (0.01 vs. -0.20).

\*significant at  $\alpha = 0.1$



**Figure 1. Interaction Effects between Communication Mode and MST Task Type**

In sum, we observed no main effect of communication mode (TMCD vs. OMB) on satisfaction with outcome. OMB showed a wide disparity, however, between conveyance and convergence process tasks: satisfaction with outcome was significantly higher for the latter. TMCD showed no meaningful disparity in this construct between the two task process types.

We also find that TMCD has small differences between convergence and conveyance tasks in outcome satisfaction and communication satisfaction. This implies that TMCD fits any types of tasks better than OMB.

**Table 9. Summary of Hypotheses Results**

Hypotheses		Results
H1	<i>TMCD will elicit significantly more messages than OMB.</i>	Unsupported
H2	<i>TMCD will elicit significantly fewer conflicting or unfriendly messages than OMB.</i>	Supported
H3	<i>TMCD will elicit significantly more initiatory messages than OMB.</i>	Supported
H4	<i>TMCD will be significantly more suited than OMB to convergence communication processes.</i>	Supported
H5	<i>TMCD will bring significantly greater satisfaction than OMB.</i>	Unsupported
H6	<i>TMCD will bring significantly greater satisfaction than OMB with convergence communication processes.</i>	Unsupported

These results have intriguing implications for business organizations in their communications and operations. TMCD may provide a legitimate communication or conference option in today's challenging business environment. CMC is certainly valuable tool, but based on this study's results, TMCD, in combination with other technologies, presents a viable strategic option. TMCD appears to be well suited to negotiation, decision-making, creative work, and other open-ended convergence tasks. Also, people's satisfaction with TMCD will remain at compatible level across different types of tasks.

Regarding the three unsupported hypotheses, we cautiously point to participants' unfamiliarity with each other, and to their different fluencies with TMCD. According to MST, if one group member displays a relatively weak understanding of the task, the medium, or other group members, communication will involve more conveyance processes, as other group members bring the one "up to speed." A group that is not self-bounded—that is, in other words, formed by researchers, not by the members themselves—will likely devote significant time to conveyance processes, even with a convergence-oriented task like negotiation, as they get to know each other and become fluent with the technology.

## Conclusions

This study examined an emerging communications technology, TMCD, and found that it mediates group communication differently than a conventional OMB. It also found that task orientation (convergence or conveyance process) significantly moderates the effectiveness of group communication.

Over the past three decades, CMC has become a major worldwide communication and electronic conferencing medium. With the arrival of social media and MCDs, we are witness to a development that promises to be as revolutionary as CMC was in its time, one that allowing users to be more open, flexible, and "connect-happy" in their personal and business interactions. The lightweight, portable MCD, giving access to social media through a simple, user-friendly, finger-touch interface, offers a convenient mode of ad hoc communication ideal for certain forms of group decision-making. Of course, just as people will choose face-to-face communication in some circumstances, CMC in others, TMCD will never supplant CMC entirely. Rather, we expect that TMCD, in combination with other MCD platforms, will complement and support both CMC and in-person interactions, as businesses and other groups pursue high-efficiency team communication.

This study has revealed some features and effects distinct to TMCD in a group decision-making context. Our findings, while provisional and exploratory, may be valuable to business organizations in their operations. We also believe our application of MST to TMCD suggests future research directions in the area of social media and MCD. For instance, future studies might include investigations of TMCD under different

information sharing contexts; assessment of TMCD's effects from an organizational behavior standpoint; and quantization of the user's distinct experiences and engagements using social media on MCD.

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## References

- Adams, S. J., Roch, S. G., and Roya, A. 2005. "Communication Medium and Member Familiarity: The Effects on Decision Time, Accuracy, and Satisfaction," *Small Group Research* (36:3), pp. 321-353.
- Baker, S. 2010 "Big Blue Embraces Social Media," [http://www.businessweek.com/print/magazine/content/08\\_22/b4086056643442.htm](http://www.businessweek.com/print/magazine/content/08_22/b4086056643442.htm).
- Campbell, J. and Stasser, G. 2006. "The Influence of Time and Task Demonstrability on Decision-Making in Computer-Mediated and Face-to-Face Groups," *Small Group Research* (37:3), pp. 271-294.
- Chen, G. M. 2011. "Tweet This: A Uses and Gratifications Perspective on How Active Twitter Use Gratifies a Need to Connect with Others," *Computers in Human Behavior* (27:2), pp. 755-762.
- Chidambaram, L. 1996. "Relational Development in Computer-Supported Groups," *MIS Quarterly* (20:2), pp. 143-165.
- Choi, K. S. 2004. "A Discovery and Analysis of Influencing Factors of Pair Programming," in Information Systems Department, Ph.D. Dissertation, New Jersey Institute of Technology, Newark, U.S.A.
- Choi, K. S., Roverpor, J., Im, I., and Fjermestad, J. 2010. "The Effects of Social Media, Personality, and Culture on Group Decision-Making," *International Conference on Information Systems (ICIS), AIS, St. Louis, MO*.
- Craig, D. A. 2011. *Excellence in Online Journalism: Exploring Current Practices in an Evolving Environment*, Thousand Oaks, CA: Sage Publications.
- Davis, G. B., Gray, P., Madnick, S., Nunamaker, J. F., Sprague, R., and Whinston, A. 2010. "Ideas for the Future of the IS Field," *ACM Transactions on Management Information Systems* (1:1), pp. 1-15.
- Dennis, A. R., Fuller, R. M., and Valacich, J. S. 2008. "Media, Tasks, and Communication Processes: A Theory of Media Synchronicity," *MIS Quarterly* (32:3), pp. 575-600.
- Elmer-DeWitt, P. 2010. "Smartphone Traffic Is Up 193% in a Year," in *CNNMoney.com*.
- Farhi, P. 2009. "Twitter Explosion," *American Journalism Review*, April/May 2009, <http://www.ajr.org/article.asp?id=4756>, date retrieved April 7, 2011
- Fields, A. 2009. *Discovering Statistics Using SPSS*, Thousand Oaks, CA: Sage Publications.
- Günther, O., Krasnova, H., Riehle, D., and Schöndienst, V. 2009. "Modeling Microblogging Adoption in the Enterprise," *Americas Conference on Information Systems (AMCIS)*, San Francisco, CA.
- Gouran, D. S. and Hirokawa, R.Y. 2003. "Effective Decision Making and Problem Solving in Groups: A Functional Perspective," in *Small Group Communication*, R. Y. Hirokawa, R. S. Cathcart, L. A. Samovar, and L. D. Henman (eds.), Los Angeles, CA: Roxbury Publishing, pp. 27-38.
- Hermida, A. 2010. "Twittering the News: The Emergence of Ambient Journalism," *Journalism Practice* (4:3), pp. 297-308.

- Hollingshead, A. B., McGrath, J. E., and O'Connor, K. M. 1993. "Group Task Performance and Communication Technology: A Longitudinal Study of Computer-Mediated versus Face-to-Face Work Groups," *Small Group Research* (24:3), pp. 307-334.
- Hughes, A. L. and Palen, L. 2009. "Twitter Adoption and Use in Mass Convergence and Emergency Events," *International Journal of Emergency Management* (6:3-4), pp. 248- 260.
- Java, A., Finin, T., Song, X., and Tseng, B. 2007. "Why we Twitter: Understanding Microblogging Usage and Communities," in *Ninth WebKDD and First SNA-KDD Workshop on Web Mining and Social Network Analysis*, San Jose, CA, pp. 56-65.
- Jung-Beeman, M., Bowden, E. M., Haberman, J., Frymiare, J. L., and Arambel-Liu, S. 2004. "Neural Activity when People Solve Verbal Problems with Insight," *Public Library of Science (PLOS) Biology* (2:4), <http://www.plosbiology.org/article/info%3Adoi%2F10.1371%2Fjournal.pbio.0020097>, date retrieved, March 18, 2011
- Kaplan, A. M. and Haenleina, M. 2010. "Users of the World, Unite! The Challenges and Opportunities of Social Media," *Business Horizons* (53:1), pp. 59-68.
- Kerr, N. L. and Tindale, R. S. 2004. "Group Performance and Decision Making," *Annual Review of Psychology* (55), pp. 623-655.
- Krishnamurthy, B., Gill, P., and Arlitt, M. 2008. "A Few Chirps about Twitter," in *The First Workshop on Online Social Networks*, Seattle, WA, pp. 19-24.
- Kwak, H., Lee, C., Park, H., and Moon, S. 2010. "What is Twitter, a Social Network or a News Media?," *International World Wide Web (WWW) Conference*, Raleigh, NC.
- Li, S. S. 2007. "Computer-Mediated Communication and Group Decision Making: A Functional Perspective," *Small Group Research* (38:5), pp. 593-614.
- Luppacini, R. 2007. "Review of Computer Mediated Communication Research for Education," *Instructional Science* (35), pp. 141-185.
- Majchrzak, A., Beath, C. M., Lim, R. A., and Chin, W. W. 2005. "Managing Client Dialogues during Information Systems Design to Facilitate Client Learning," *MIS Quarterly* (29:4), pp. 653-672.
- McGrath, J. E. 1984. *Groups: Interaction and Performance*, Englewood Cliffs, NJ: Prentice-Hall.
- McLeod, P. L. and Liker, J. K. 1992. "Electronic Meeting Systems: Evidence from a Low-Structure Environment," *Information Systems Research* (3:3), pp. 195-223.
- Meyer, P. and Dibberny, J. 2010. "An Exploratory Study about Microblogging Acceptance at Work," *Americas Conference on Information Systems (AMCIS)*, August 12-15, 2010, Lima, Peru
- Miller, C. C. 2009. "Twitter Plans to Offer Shopping Advice and Easy Purchasing," in *New York Times*, June 19, 2009.
- Naude, P., Lockett, G., Islei, G., and Drinkwater, P. 2000. "An Exploration into the Influence of Psychological Profiles upon Group Decision Making," *Journal of the Operational Research Society* (51:2), pp. 168-175.
- Oracle. 2010. "Oracle Twitter Website", <http://oratweet.com/>.
- Orlitzky, M. and Hirokawa, R. Y. 2001. "To Err is Human, to Correct for It Divine: A Meta-Analysis of Research Testing the Functional Theory of Group Decision-Making Effectiveness," *Small Group Research* (32:3), pp. 313-341.
- Perkins, D. 2000. *The Eureka Effect: The Art and Logic of Breakthrough Thinking*, New York, NY: Norton.
- Pornsakulvanich, V., Haridakis, P., and Rubin, A. M. 2008. "The Influence of Dispositions and Internet Motivation on Online Communication Satisfaction and Relationship Closeness," *Computers in Human Behavior* (24), pp. 2292-2310.

- Qualman, E. 2010. *Socialnomics: How Social Media Transforms the Way We Live and Do Business*, Hoboken, NJ: John Wiley and Sons.
- Rainer, E. K. and Turban, J. 2010. *Introduction to Information Systems: Supporting and Transforming Business* (3rd ed.), Hoboken, NJ: John Wiley and Sons.
- Rhoads, C. 2011. "Technology Poses Big Test for Regimes," in *Wall Street Journal*, February 12, 2011.
- Roberto, M. A. 2003. "McDonald's: Super-Sized Troubles (A)," *Harvard Business Review*, article # 9-3-3-098, Revised November 6, 2003.
- Sager, K. L. and Gastil, J. 2006. "The Origins and Consequences of Consensus Decision Making: A Test of the Social Consensus Model," *Southern Communication Journal* (71:1), pp. 1-24.
- Strauss, S. and McGrath, J. E. 1994. "Does the Medium matter? The Interaction of Task Type and Technology on Group Performance and Member Reactions," *Journal of Applied Psychology* (79:1), pp. 87-97.
- TIA, 2010. "2010 Information and Communications Technology (ICT) Market Review and Forecast." Telecommunications Industry Association, Arlington, Virginia, U.S.A.
- Twitter, 2010. <http://twitter.com/>
- Wagstaff, J. 2011. "Technology Shapes Revolution," in *Wall street Journal*, March 10, 2011.
- Wall Street Journal. 2011. "Groupon's Revenue Grew 2241% Last Year," June 2, 2011
- Wortham, J. 2010. "Cellphones Now Used More for Data Than for Calls," *New York Times*, March 13, 2010.
- Zhao, D. and Rosson, M. B. 2009. "How and Why People Twitter: The Role that Micro-Blogging plays in Informal Communication at Work," *Proceedings of the ACM 2009 international conference on Supporting group work*, Sanibel Island, FL, U.S.A. May 10 - 13, 2009, pp. 243-252.