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6-18-2013

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DO THEY TWEET DIFFERENTLY? A CROSS-CULTURAL GROUP STUDY OF TWITTER USE ON MOBILE COMMUNICATION DEVICES[1]

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Abstract

Culture is one of the classic and most widely studied topics in the field of technology. People of different cultural backgrounds interpret, consume, and disseminate technology differently. One conspicuous aspect of culture is communication. The expression, conversational patterns, and contextual nuances of different languages make communication a distinct cultural experience. Culture influences how communication functions between different people in different social contexts. It is also an underlying feature of encoded messages; a knowledge of the sender's culture helps to discern his or her intention. Communication technology is also susceptible to the influence of culture. The mobile and social aspects of technology add another dimension to the communication process. Twitter, a leading social medium run on a mobile communication device, is a good example.

This empirical study examines the use of Twitter in users with two distinctly different cultural ideologies: individualism (characteristic of the U.S.A.) and collectivism (common in Korea). Participants in both countries took part in a four-man group decision-making experiment. The groups were given decision tasks to complete within a timed period. The study yielded the following results: 1) the Korean participants tweeted significantly more often than the American participants; 2) the Korean participants initiated significantly more new tweets than the American participants; 3) the Korean participants sent significantly more friendly tweets than the American participants; 4) the American participants expressed disagreement significantly more often than the Korean participants; and 5) the Korean participants exhibited a significantly higher level of group cohesiveness than the American participants. These results shed light on the cultural applications of this new, emerging technology which is becoming essential to personal and business information sharing and communication of people of different cultures all over the world. Data analysis, discussion, and implications are provided.

Keywords: Cross-cultural study, Individualism, Collectivism, Twitter, Mobility, Group collaboration

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1   INTRODUCTION

Drawing a clear line between what is cultural and what is not cultural can be difficult (Ajiferuke and Boddewyn 1970). Ongoing globalization of the business world may seem to diminish national boundaries, which has an effect on culture (Hickson et al. 1974; Ohmae 1985). However, many would agree that certain aspects of any society are influenced by cultural norms and that cultural influences are woven to varying degrees throughout the social fabric of society. Communication is a good example. Communication may be viewed as a window on culture, an external reflection of cultural values (Donabedian et al. 1998). Culture influences communication between people in different social contexts. It is also an underlying feature of encoded messages; a knowledge of the sender's culture helps to discern his or her intention. Communication within a society may be normalized. The most deeply-rooted cultural norms of a society may be ascertained by examining communication among its people (Samovar et al. 1981).

The relationship between culture and communication is also manifested in various forms of mobile technology. In recent years, adoption of smartphones and other smart mobile devices such as tablet PC has rapidly increased around the world. One industry report revealed that China has been the world's largest smartphone market since 2010 (Pyramid Research 2009). Compound annual growth rates in the smartphone market exceeding 30% are predicted in Brazil, India, Nigeria, Russia, and Turkey by 2014 (Pyramid Research 2009). These technologies are culturally adaptable. For example, a smartphone manufacturer may offer a special function that helps Islamic people find Mecca – the most holy place for a Muslim – from anywhere. Muslims must pray religiously five times a day facing toward Mecca. This special smartphone feature facilitates this Islamic religious practice and may increase their attachment to their smartphones. Smart technology may also be culturally interpreted and used differently by people of different cultures. For example, a person living in the U.S. may not answer an anonymous or strange call, but in a North African country like Morocco, that stranger's call would surely be answered due to long-standing custom. In Morocco, a stranger or traveler is welcomed with hospitality. This friendly custom has been cultivated in Morocco and neighboring countries with desert climates. Their indigenous people are accustomed to being charitable and hospitable to strangers who may be in a danger, stranded in the middle of the desert in need of help. In return, their culture teaches that they will be blessed by their God for their hospitable act.

The interpretive flexibility technology perspective (Bijker 1995; Bijker et al. 1987) emphasizes how different social groups that adopt the same technology can have different interpretations of that technology, including its functions and technical capabilities. Many characteristics of a technology are fundamentally influenced by the social context in which it is consumed (MacKenzie 1999). Different circumstances engender different attitudes, perceptions, and interpretations about a new technology (Haddon 2004).

Several previous studies of the association between culture and technology have provided substantial evidence that culture exerts its influence in a variety of ways (Leidner and Kayworth 2006). Culture explains how we process (Usunier et al. 2009) and interact (Sia et al. 2009) differently with online information. It also affects how we accept technology (Bandyopadhyay and Fraccastoro 2007; Srite and Karahanna 2006).

The mobile communication process is inherently different from the communication process by desktop or laptop PCs and other similar computer-mediated communication. The limited word count and short message are expected to gender new and different forms of communication saliencies and user behaviors. Twitter on a mobile device (TMCD) such as smartphone is one emerging popular form of mobile communication. We have witness how this prodigious combination played a vital role across different cultural and national boundaries for world's attention – Japanese tsunami, Haiti's earthquake, and Egypt's revolution. On the practical business side, there is an increasing number of business organizations that foster mobile-friendly workspace and embrace a policy that allows their employees to bring their own mobile devices (BYOD) for various progressive reasons (Honeycutt and Herring 2009; Meyer and Dibberny 2010; Olavsrud, 2013a; Olavsrud, 2013b; Deloitte, 2013). Given today's robust mobile ecosystem, TMCD or other similar mobile communication technology is expected to continue its prowess serving its users at various levels and contexts.

Although we are starting to see some general culture-related mobile and/or social media studies (Choi and Scott 2011; Ji et al. 2010), there is a scarcity with the studies emphasizing on the *culturally-interpreted mobile communication process,* especially in the context of group collaboration. Furthermore, there is no specific and definitive *culturally-induced* mobile communication theory. Given these both academic and practical circumstances, IS community is called to provide some form of theoretical framework and elucidations for mobile communication process. The culture variable is certainly one of the major variables to be considered in today's globalization processes among many nations. As a contribution in responding to these deficiencies, this study examines the cultural idiosyncrasies in group using TMCD. Twitter or micro-blogging is selected mainly because it is a leading communication application among social media besides Facebook at current time. In the context of decision-making within a small group, the TMCD group-level and user-level analysis and the effects of culture on TMCD communication are examined. Suggestions for future research on TMCD communication in culturally-influenced group processes are also offered.

2   LITERATURE REVIEW

2.1   The Information Systems Perspective on Culture

IS research has defined culture as a socio-technical system, examining its effects on technology, especially in the area of technology acceptance. Acceptance of a technology depends largely on how people perceive its usefulness, ease of use (Bandyopadhyay and Fraccastoro 2007), and other factors (Venkatesh et al. 2003). One factor that influences these perceptions is culture. Leidner and Kayworth (2006) comprehensively reviewed 82 articles concerned with culture in the IS field. They identified five areas in which societal culture exerts some influence: IS development, IT adoption and diffusion, IT use and outcomes, IT management and strategy, and IT culture. The influence of IT on culture was also examined. They identified two separate research paths, organizational and national, concluding that no de-facto standard measurement (or model) has been developed for measurement of the relationship between culture and IT. A wide range of topics has been addressed, including the influence of IT on culture and the concept of culture–IT fit. The review concluded with a theory related to conflict between IT and culture.

Strite and Karahanna (2006) investigated the effects of personality traits on espoused national cultural values. Testing their proposed model in two studies, they reported that feminine individuals who exhibited high uncertainty avoidance were significantly influenced by social norms, and that the masculinity/femininity cultural dimension significantly moderates the relationship between perceived ease of use and behavioral intention. However, it had no significant effect on the relationship between perceived usefulness and behavior intention.

In recent studies focusing on new social computing technologies, however, researchers have focused on the new technology learning curve in the context of IT adoption. Most recently, IT acculturation and IT post-adoption have emerged as important (Ji et al. 2010; Lee et al. 2007). Walsh (2010) defined IT acculturation as "*the structuring process of the IT–culture layer… a cultural learning process resulting from exposure to IT, and experiences with IT*". The author introduced the various levels and components of IT acculturation, proposing a new IT usage model that emphasized IT acculturation as an antecedent to IT utilization. Lee et al. (2007) studied mobile internet users from three East Asian countries: Korea, Hong Kong, and Taiwan. They reported significant effects of uncertainty avoidance, individualism, contextuality, and time perception. The study also discerned subtle cultural differences among the three countries and called for future research to include several Western countries for comparison. Such a study soon followed (Ji et al. 2010) examining the use of social networking services and the formation of social capital in the United States, Korea, and China. Though no significant effects of culture differences in using Social Network Services (SNSs) were found, both Korean and Chinese subjects valued expert search functions and connections to friends (group cohesiveness and group harmony), while American subjects exhibited significantly more communication and social capital formation (individual information and knowledge seeking).

Similarly, Sia et al. (2009) studied online peer trust within groups of subjects from Hong Kong, which represented Eastern culture, and Australia, which represented Western culture. The Hong Kong groups showed significantly more peer trust and group conformity than the Australian groups. Udo

and Bagchi's (2011) study utilized Hofstede's cultural dimensions to relate technology acceptance to espoused national cultural values in developing countries. Positive influences of power distance, individualism and collectivism, and uncertainty avoidance were found.

2.2   Cultural Dimensions

In many of studies of the relationship between culture and technology, Hofstede's model (Hofstede 1980) has been the most favored instrument for culture analysis. Despite some concerns (Ess and Sudweeks 2005), the well-known five dimensions – power distance, individualism, masculinity, uncertainty avoidance, and long-term orientation – of Hofstede's model still provide useful interpretations and insights.

In addition to these five dimensions, other major models have identified other significant cultural dimensions, such as locus of control and context (Hofstede 1980; Hofstede and Bond, 1988; Lee et al. 2007; Triandis and Suh 2002). These various cultural dimensions aid in understanding and interpreting diverse culturally-induced behaviors and exhibitions. Table 1 describes these diverse cultural dimensions.

Cultural dimensions	Descriptions
Power distance	Measures the extent to which the less powerful members of organizations and institutions accept and expect that power is distributed unequally.
Horizontal and vertical individualism vs. collectivism	Measures the level of conformity among group members. Horizontal individualism describes a person who pursues his/her own interests, whereas vertical individualism describes a person who strives to be the best in the group.
Masculinity vs. femininity	Measures how a group exhibits more of either men's or women's values. Men's values are assertive and competitive, while women's values are modest and caring.
Uncertainty avoidance	Measures the level of a group's tolerance toward uncertainty and ambiguity.
Time orientation	Measures how a group focuses more on long-term values, such as thrift and perseverance, or short-term values, such as obligations and saving face.
Context	Measures how communication is based on implicit or explicit information.
Locus of control	Measures the degree to which a person perceives his or her life to be influenced by others or self-controlled.

Table 1.   Diverse Cultural Dimensions.

In this study, the impact of culture on TMCD communication is examined in group communication processes. Both Western and Eastern cultures are featured, the two prominent cultures traditionally depicted as representing individualism and collectivism, or the ideological cultural dimension. Participants from the United States and Korea represent Western and Eastern cultures, respectively. Despite these profiles, one may cautiously point to rapid globalization phenomenon and global information dissemination and sharing (Hickson et al. 1974; Ohmae 1985), where these may influence cultural values and induce normative cultural changes, trans-culture (Slimbach 2005). However, U.S. is still perceived as an individualistic country and Korea as a collectivistic country. In many recent studies, Korea has been identified as a collectivistic country in representing collectivistic culture (Choi et al. 2011; Inglehart and Welzel 2005; Kim et al. 2011; Lee et al. 2007). These profiles of both countries provide a concise summary and comparison between the two that contribute to the theoretical and hypothesis developments.

From the studies of Hofstede (2010), Lee et al (2007), and Triandis and Suh (2002), we provide following summary profiles of both American and Korean:

Americans expect to share equally, provide open access to information to everyone, and communicate openly, directly, and actively. Theirs is a highly individualistic culture. They are explicit in their intention to achieve their goals. In the workplace, they expect their employees to be self-reliant and strive for quick results. They tend to express and talk freely about their goals and objectives. They are more direct in resolving conflicts. They are

willing to take risks and accept innovative new ideas. In a group, they use more verbal communication than body language. Weak group bonding and low commitment are characteristic of Americans. They believe in reaping the benefits of their own effort and determining their own fate.

By contrast, Koreans utilize more nonverbal communication techniques, including metaphor and implicit messages. Korea is a hierarchical, autocratic society in which power is centralized, inequalities are inherent, and top-to-bottom command lines are typical. Koreans value collectivism and place great emphasis on group and long-term extended relationships. Group loyalty is highly prized and takes precedence over rules and regulations. Every group member takes responsibility for ensuring the well-being of other members. Uncertainty avoidance is characteristic of Koreans; thus, unorthodox behavior, new ideas, and innovation are not always well received.

Despite these profiles based on the findings of research comparing two nations representing two prominent cultures, rapid globalization, information dissemination, and sharing are also part of today's transcultural reality (Slimbach 2005; Hickson et al. 1974; Ohmae 1985). These factors may influence cultural values and induce normative cultural changes at the country level. However, the U.S. is still perceived by many as an individualistic country and Korea as a collectivistic country. In many recent studies, Korea has been used to represent collectivistic culture (Choi et al. 2011; Inglehart and Welzel 2005; Kim et al. 2011; Lee et al. 2007).

		* maximum value = 100
Cultural dimensions	The United States	Korea
Power distance[*]	40	60
Individualism vs. collectivism[*]	91	18
Masculinity vs. femininity[*]	62	39
Uncertainty avoidance[*]	46	85
Time orientation[*]	29	75
Context	Low	High
Locus of control	Internal	External

Table 2.   Cultural Dimensions in the U.S. and Korea.

These profiles of both countries provide a concise summary facilitating comparison between the two and contributing to the development of our hypotheses. Arguments and rationale for each hypothesis are presented below.

3   HYPOTHESES DEVELOPMENT

This empirical study examines the use of Twitter in users with two distinctly different cultural ideologies: individualism (characteristic of the U.S.A.) and collectivism (common in Korea). We expect Korean groups to exchange significantly more tweets because Erez and Earley (1993) suggested that collectivists put greater emphasis on two-way communication, more personal communication, and more frequent communication than individualists, especially to coordinate activities and clarify decision-making processes. They are also more concerned with other members' experience and relationships (Te'eni 2001). By exchanging more tweets, the Korean groups may establish sound, reassuring two-way communication while working toward group goals. Moreover, we assume that more tweets will instill confidence in their relationships with others. The cultural profile analysis in the previous section suggested that Koreans rely more on nonverbal communication cues and implicit messages than Americans do, which may require tweets for clarification. Their inclination to strengthen in-group relationships and avoid any uncertainty may also result in more tweets. More tweets are likely to increase in-group closeness and familiarity and diffuse any unorthodox behaviors or uncontested ideas. Thus, we hypothesize that

> *H1: Korean groups will tweet each other significantly more often than American groups.*

Collectivists tend to conform to in-group norms, be more cooperatively oriented, and respond more favorably to group goals than individualists (Elleson 1983; Mann 1980). They tend to view group

membership as more long-term and permanent than do individualists (Earley and Gibson 1998). In other words, collectivists are more willing to strive for and be attuned to group goals and activities. Given these facts, we expected that the Korean participants would place a higher priority on their group's goals than on their own personal goals. In the context of this study, this would translate into more new or initiatory tweets, not necessarily high in quality, and emphasis on completing the group task over other related issues. Korea is a highly collectivistic society with strong group loyalty, as indicated by the score of 18 for the individualism–collectivism dimension (Table 2). We speculate that the priority of the group will be the members' main focus, and that this focus will result in more new and initiatory tweets related to completion of the group task than in the American group. Therefore, we hypothesize that

H2: Korean groups will send significantly more new (initiatory) tweets than American groups.

Rice et al. (1998) reported that collectivists prefer a synchronous medium, which allows observation of others' reactions. This preference on the part of the Korean participants should generate many tweets in order to establish a friendly group experience. Additionally, collectivists prefer indirect and informal methods of conflict resolution (Ting-Toomey et al. 1991), emphasizing context more than content and implicit more than explicit communication (Gudykunst 1997; Gudykunst and Matsumoto 1996). The locus of control dimension for Koreans is external. Put another way, in Korea, people believe that their fate is largely in the control of others. This belief inspires Koreans to seek friendlier relationships than Americans under similar contextual conditions. By sending more friendly tweets, Koreans secure their positions within the group and influence the in-group atmosphere positively. Conversely, Americans, with their high score of 91 on the individualism–collectivism dimension (Table 2), believe their fate depends on their own action or inaction. We speculate that this focus will generate fewer friendly tweets compared to members of the Korean group. We thus expect more in-group harmonious and friendly tweets coming from the Korean group.

H3: Korean groups will send significantly more friendly tweets than American groups.

Given their tendency toward group friendliness, collectivists are more concerned with group processes and harmony than individual agendas. In case of possible group conflict or strong disagreement, they are inclined to withdraw from a direct confrontation and deal with the disagreement outside the group to resolve the issue later (Ting-Toomey et al. 1991). Collectivists also refrain from raising questions or problems that may threaten group harmony or disrupt the friendly atmosphere; they prefer to deal with such questions after the meeting, on a one-to-one basis, if required (Vallaster 2005). The results for the dimensions of uncertainty avoidance, time orientation, context, and locus of control (Table 2) summarize and connote the facts that Koreans embrace group values and Americans emphasize individual values. When facing an uncertain future or change, Americans prefer to deal with any differences or conflicts in order to clarify the situation. By contrast, Koreans prefer to reduce friction where possible. The one decisive fact that divides the two societal ideologies is that Koreans believe their future fate is largely influenced by others, while Americans do not. We therefore expect members of the American group to send more requests for clarification and tweets expressing disagreement than members of the Korean group.

H4: American groups will send significantly more tweets expressing disagreement than Korean groups.

Previous studies on group communication and decision-making commonly make distinctions between satisfaction with communication and satisfaction with outcome (Green and Taber 1980; Ocker et al. 1995/1996). Communication satisfaction can be briefly described as the level of satisfaction with the communication process, which includes interactions among people and frequency and content of communication. Outcome satisfaction is about the level of satisfaction with the outcome produced by the group. These two items are closely related in assessments of the group communication process.

The spontaneity and immediacy of TMCD allows users to respond quickly and maintain a high pace of communication. These features are very important to demanding users. Individualists are characterized in group settings as content-oriented, explicit, and more focused on individual goals (Argyle et al. 1986; Gudykunst and Ting-Toomey 1988; Gudykunst et al. 1987; Wallbott and Scherer 1986). Therefore, we speculate that American participants may highly value the nature of

communication via TMCD. The context dimension (Table 2) lists the U.S. as a low-context society. Thus, Americans may be expected to strive for equal and open communication in accordance with their explicit intention to fulfill their goals. The spontaneity, immediacy, and effortlessness of TMCD support the explicit orientation, willingness to discuss content, and confront any conflict or individual issues within the group. We speculate that these characteristics would yield greater communication satisfaction for the members of the American group.

> **H5a**: *American groups will experience significantly higher levels of communication satisfaction than Korean groups.*

In a decision-making situation involving conflict, individualistic cultural attributes will infuse the group communication process (Donabedian et al. 1998) with problem definition and solution articulations (Singelis and Brown 1995) and also with some explicit anger and distress (Gudykunst and Nishida 1994). We suspect that American participants may leverage the synchronicity and spontaneity characteristic of TMCD to their advantage. Thus, the American groups may be expected to achieve the desired outcome and experience high outcome satisfaction. They may feel gratified by the immediate, direct, and content-oriented communication mode that is TMCD. Therefore, we hypothesize that

> **H5b**: *American groups will experience significantly higher levels of outcome satisfaction than Korean groups.*

Triandis (1995, 1998) reported that more in-group friendliness and harmonious gestures are hallmarks of collectivism. Erez and Earley (1993) also emphasized that collectivist individuals favor more personal communication to facilitate decision-making processes. A collectivist culture is arranged around the group rather than the individual; its pronoun of choice, as Hofstede points out, is not "I", but "we". In collectivist countries such as Korea, China, and Japan, people pay respect to their ancestors in religious rituals and take great pride in national traditions. This "we" comes to the fore whenever these countries are in crisis. For example, in 1998, during the financial crisis, the people of Korea willingly donated gold and other personal valuables to their government. Outsiders found this national collective act compelling. It became one of the world's top news stories of the year (BBC 1998). All cultural dimensions for Korea listed in Table 2 point directly or indirectly to the attribute of strong group cohesiveness. For the individualism–collectivism dimension, the U.S. scored 91 and Korea 18. This large gap specifically reflects the difference between these two countries in terms of group cohesiveness. Indirectly, the scores and values for other dimensions illustrate significant differences in how Americans and Koreans relate to the group context. We expect that people with a collectivist mindset, such as the Koreans, will display more group cohesion than people with an individualistic mindset, such as the Americans, regardless of the communication medium used (Tan et al. 1998).

> **H6**: *Korean groups will exhibit significantly higher levels of group cohesiveness than American groups.*

4   EMPIRICAL ANALYSIS

4.1   Overview of the Experiment

The developed hypotheses were tested in several rounds of experiments. The study population was comprised of undergraduate and MBA students from the U.S. and Korea. Participants were recruited from classes and through on-campus advertisements, promising a small extra-credit or financial reward of US$10 if completed. Subjects were briefed, either individually or in groups, before starting the experiment. Subjects were told that the purpose of the study was to examine how people use TMCD. A preliminary evaluation was performed to determine each subject's background with Twitter and smartphone use after the briefing. Since the experiment in this study required substantial experience with TMCD, only subjects who owned a smartphone and had utilized TMCD in the past were selected for inclusion. In order to prevent subjects' personal tweets mixed with the tweets for the experiment, each subject was asked to create a new ID and use it for the experiment.

In total, three rounds of experiments were conducted in Korea and the U.S. The first was a pilot experiment to validate the experimental tasks and fine-tune the instruments. Based on the results of the pilot, the experimental tasks and measurements were modified and used in the second and third rounds. The resulting data were used for the final analysis in this study. Subjects were asked to use only TMCD for the assigned task and to complete the task within a ten-day period. All messages exchanged among team members were collected and their perceptions were evaluated. After the task was completed, subjects were asked to respond to an online post-experiment questionnaire. Each participant who completed the task and questionnaire was rewarded a gift certificate of $10 (or equivalent value).

Subjects were asked to work on a randomly assigned task in a team of four using TMCD. Although all groups started with four members, dropout occurred in some groups, which resulted in two- or three-person groups. In order to ensure that all teams had sufficient opportunity for interaction among team members, two-person groups were merged with other two- or three-person groups if the dropouts occurred during the earlier stage of the experiment (up to the point at which members introduced themselves). If dropouts resulting in two-person groups occurred at a later stage of the experiment (after the point at which members introduced themselves), data for these groups were eliminated from the final analysis.

After two-person teams had been eliminated, data was collected from 22 four-person groups, 11 three-person groups, and one five-person group, for a total of 126 subjects. After groups with few interactions had been eliminated (< 7 exchanged messages), 31 groups remained in the final dataset, 15 groups from Korea and 16 groups from the U.S.

4.2 Experimental Design

Each team was randomly assigned one of the six tasks listed in Table 3 and given a ten-day period to complete the task. All groups were instructed to use TMCD for active discussion of the tasks in order to arrive at a group consensus. Upon completing the given task, each team member was asked to complete a post-experiment survey. The survey was designed to elicit comments regarding communication satisfaction, outcome satisfaction, and group cohesiveness (for details, see section 4.4 below).

The six tasks (Table 3) were chosen from various sources. The first three tasks were case studies from an IS textbook (Rainer and Turban 2010). The fourth and fifth tasks were adopted from previous empirical studies (Choi 2004; Strauss and McGrath 1994). The sixth task was a case study and question from a Harvard Business School publication (Harvard Case #9-303-098).

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

Table 3.   Experimental Tasks.

For every team, the Twitter ID was requested from each member. They were then told to exchange their IDs, follow all team members, and greet one another to "break the ice". The instructions were not to use any medium to communicate other than TMCD. Participants received frequent reminders about this instruction. The experiment facilitator provided supervision of this parameter throughout the experiment.

After each team had completed the assigned task, all exchanged tweets were collected for analysis. Subjects' IDs were used to collect tweets using Twitter API. Tweets from each team were put together and arranged sequentially in order of time as reconstructed conversations of each team.

4.3   Content Analysis

In order to test the hypotheses developed above, qualitative content analysis was conducted as well as quantitative analysis. With no previous similar studies for comparison or to base our analysis upon, the task of tweet message coding posed an unprecedented challenge. We carefully crafted a viable coding schema composed of three dimensions for hypothesis testing: *task specifics*, *friendliness*, and *agreement*. The final coding schema was completed after enhancement as a result of the pilot coding sessions.

- *Task specifics*: A message category that pertains to the task or its administration. The sub-categories are described below.

  o An *initiatory message* is a new task-specific message initiated by a team member to start a conversation or discussion (e.g., "Harry should be next and then Tom and Phil").

  o A *referred message* is a task-specific message that refers to an earlier message and is sent for the purposes of clarification (e.g., "McDonalds does have free Wi-Fi just like Starbucks does. http://t.co/oV5I0y9S").

  o A *process-related message* is a task-specific message that checks for or clarifies information about the team process (e.g., "So what's the next step for this project?")

  o A *non-task-specific message* is a message that is task-irrelevant or personal (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*: A message category that exhibits a friendly tone in a message (e.g., a smiley-face emoticon, or "how do we do that. lol sorry I'm awful at twitter").

  o Each message was classified as friendly, neutral, or unfriendly.

- *Agreement*: A message category that supports or agrees with other message(s) (e.g., "Harry should be next, I agree, and then Tom and Phil").

  o Each message was classified as agreeing, neutral, or disagreeing.

All collected tweets were coded against each dimension. For instance, a message could be classified as "agreeing", "process-related", and "friendliness-neutral". Four judges who were IS graduate students with years of TMCD experience conducted the coding. Multiple pilot coding sessions were held to ensure inter-judge reliability. During the pilot sessions, the judges reconciled their coding differences. After five pilot sessions, the inter-judge reliability ranged from 0.94 to 0.99 depending on the dimensions of coding. For example, if two coders classified 95 out of 100 messages into same categories and 5 into different categories for the "Task specifics" dimension, inter-coder reliability for the "Task specifics" dimension was 0.95 (= 95/100).

Since the number of messages is an important measure in this study, objective comparison of this parameter was critical. Some concerns arose about possible biases due to differences in message-composing habits across subjects. Different people may have different conventions in composing messages; some may tend to divide a message into multiple shorter messages, while others may say everything in one longer message. If multiple tweets resembled a single message on a topic, then the messages were collectively labeled as one. Similar to the message coding, the decision to merge multiple tweets into a single message was carefully considered and discussed during the pilot coding sessions. Coders then made independent decisions on mergers during coding. The total number of original tweets was 2,147 (47.9 per team). This number was reduced to 1,608 (32.1 per team), after merging. The merged messages were used in the final data analysis.

No significant difference in the average total number of messages was observed between the U.S. and Korean teams based on the results of a simple t-test (p = 0.187). Table 4 summarizes the average

number of messages in the message type sub-categories in both countries. Values in parentheses indicate the ratio values.

Message type		U.S. (ratio)	Korea (ratio)	All (ratio)
Average number of messages per team		26.1	38.5	32.1
Friendliness	Unfriendly	1.9 (0.02)	0.0 (0.0)	1.0 (0.01)
	Neutral	21.3 (0.93)	21.9 (0.54)	21.6 (0.73)
	Friendly	2.9 (0.05)	16.5 (0.46)	9.5 (0.26)
Task specifics	Initiatory	9.1 (0.55)	16.9 (0.48)	12.9 (0.51)
	Referred	0.2 (0.01)	0.8 (0.03)	0.5 (0.02)
	Process	7.2 (0.34)	12.9 (0.31)	9.9 (0.32)
	Non-task-specific	9.6 (0.11)	7.8 (0.19)	8.8 (0.15)
Agreeableness	Agreeing	1.8 (0.17)	4.3 (0.10)	2.1 (0.13)
	Neutral	23.6 (0.79)	33.5 (0.87)	28.1 (0.83)
	Disagreeing	1.2 (0.04)	0.6 (0.03)	0.9 (0.04)

Table 4.   Message Evaluations.

To ensure a rigorous analysis, a generalized linear model (GLM) with ratio measures was adopted. The average number of messages per team was analyzed using the original data because it was the denominator in calculating ratio measures. Ratios were calculated by dividing the number of messages of a given type sent by a group by the total number of messages sent by the group. For example, if a group had a total of 30 messages, 3 of which were friendly messages, then the ratio of friendly messages for that team was 0.1 (3/30). Ratios are shown in Table 5. Ratios were measured in order to eliminate possible bias due to differences in the total number of messages in each group. If a group had a large total number of messages, its messages in all categories tended to be large. In the GLM model, the country was set as the main variable; the task type, experiment round, and team size were set as the control variables. The team size variable was used to address differences in group size (three or five instead of four members).

Results of the GLM analysis in Table 5 show that Korean groups sent significantly more messages than the American groups. This implies that Korean groups exchanged significantly more messages than the American groups. This finding supports H1 (*Korean groups will tweet each other significantly more often than American groups*). Table 5 also shows that Korean groups sent significantly more initiatory messages than American groups. Therefore, H2 was also supported (*Korean groups will send significantly more new tweets than American groups*).

Korean groups sent significantly more friendly messages. Thus, H3 was also supported (*Korean groups will send significantly more friendly tweets than American groups*). The American groups also sent more messages expressing disagreement than the Korean groups overall. This finding supports H4 (*American groups will send significantly more tweets expressing disagreement than Korean groups*).

Dependent variable	F values	Means	
		U.S.	Korea
Number of total messages	3.9[*]	26.1	38.5
Ratio of friendly messages	22.6[***]	0.09	0.35
Ratio of initiatory messages	3.4[*]	0.41	0.47
Ratio of disagreeing messages	3.0[*]	0.05	0.01

* significant at $\alpha = 0.1$, *** significant at $\alpha = 0.01$

Table 5.   GLM Analysis of Messages.

4.4   Post-experiment Questionnaire Analysis

Participants completed a post-experiment questionnaire designed to describe a typical TMCD user experience in the team collaboration environment. The questionnaire measured communication satisfaction, outcome satisfaction, and group cohesiveness. These constructs were adopted from earlier published studies (Chidambaram et al. 1990, 1991; Green and Taber 1980; Ocker et al. 1995, 1996). The questionnaire was originally written in English. Therefore two different interpreters

separately translated it into Korean. These two versions were compared and differences were resolved through discussions between the interpreters. Then, the Korean version was re-translated into English by a third translator to be compared with the original version. Any significant differences were resolved by the translator and researchers.

The total number of respondents with valid and complete survey responses was 84 (43 from Korea and 41 from the U.S.). To ensure the validity and reliability of the instrument (Straub 1989), a factor analysis was performed using the principle component and VARIMAX methods. Items with factor loading values <0.5 were removed. The Cronbach's alpha values of the finalized constructs were all acceptable ($\alpha \geq 0.7$). The factor scores of the three constructs were used as dependent variables in the subsequent analyses.

A GLM analysis on the questionnaire was performed with the task type as a control variable. The results are summarized in Table 6. A main interaction effect was observed between the country variable and two constructs: outcome satisfaction and group cohesiveness. The Korean groups exhibited significantly higher levels of group cohesiveness (Korea: 0.48, U.S.: −0.55). This supports H6 (*Korean groups will exhibit significantly higher levels of group cohesiveness than American groups*).

*** significant at $\alpha = 0.01$

Dependent variable	F values	Means	
		U.S.	Korea
Communication satisfaction	2.1	−0.78	0.24
Outcome satisfaction	14.8***	−0.65	0.56
Group cohesiveness	9.5***	−0.51	0.49

Table 6.   GLM Analysis of Messages.

No significant difference in communication satisfaction was found between the Korean and American groups. However, the American groups reported experiencing significantly lower levels of outcome satisfaction, which is contrary to H5b. Therefore, no support was evident for H5a (*American groups will experience significantly higher levels of communication satisfaction than Korean groups*) or H5b (*American groups will experience significantly higher levels of outcome satisfaction than Korean groups*). The hypotheses summary is shown in Table 7 below.

Hypotheses	Results
H1: *Korean groups will tweet each other significantly more often than American groups.*	***Supported***
H2: *Korean groups will send significantly more new (initiatory) tweets than American groups.*	***Supported***
H3: *Korean groups will send significantly more friendly tweets than American groups.*	***Supported***
H4: *American groups will send significantly more tweets expressing disagreement than Korean groups.*	***Supported***
H5a: *American groups will experience significantly higher levels of communication satisfaction than Korean groups.*	Not supported
H5b: *American groups will experience significantly higher levels of outcome satisfaction than Korean groups.*	Not supported
H6: *Korean groups will exhibit significantly higher levels of group cohesiveness than American groups.*	***Supported***

Table 7.   Summary of Hypotheses Test Results.

5   DISCUSSION

In this study, Korean groups tweeted each other significantly more often than American groups. This result confirms those of earlier studies, which demonstrated that collectivists tend to conform to in-group norms, have more cooperative groups, and respond more favorably to group goals than individualists (Elleson 1983; Mann 1980). In addition, collectivists prefer frequent communication in order to achieve group goals. They send personal messages to ensure group harmony (Erez and Earley 1993). Many tweets from the Korean groups were related to status confirmation to ensure sound in-

group working relationships. Sample tweets included *"I am not terribly good at this kind of assignment. Please understand if I post messages making no sense, hahaha,"* *"Wow! Your answer is good!"*, and *"I know that all of you are busy preparing final exam. Let's do our best and have fun!"*. Collectivists are earnestly concerned about how others perceive them. They care about other members' experiences and in-group relationships (Te'eni 2001). In a demanding situation, this attribute may be even more apparent. The frequent tweeting and more personal tweeting may be ascribed to this attribute.

The results of testing of H3 (*Korean groups will send significantly more friendly tweets than American groups*) are closely aligned with those of H1. More frequent and friendlier tweets ensure group harmony and conformity while reinforcing in-group relationships. The horizontal individualism vs. vertical collectivism dimension (Table 2) explains the significant gap in behavior between the individualistic and collectivistic groups. The fact that the Korean group sent significantly more friendly tweets connotes the expectation that members warmly welcomed each other's membership and contribution. Korean group members were significantly more cognizant about being accepted in a group, placing less value on advancing individual agendas and resolving conflict (Rice et al. 1998; Ting-Toomey et al. 1991). For the locus of control cultural dimension, the frequent and friendlier tweets from Korean groups reflect the fact that Korea is a country in which external control is the expected norm. Koreans feel that others have substantial influence on their lives. This belief prompts them to present themselves as acceptable to others in the form of frequent and friendlier tweets. Koreans feel that it is important to maintain sound relationships with other members.

For these same reasons, H4 was supported in this study (*American groups will send significantly more tweets expressing disagreement than Korean groups*). Collectivists generally avoid open confrontation in group contexts, preferring to deal with the conflict later on a one-to-one basis (Vallaster 2005). In the group decision-making context utilized in this study, Koreans refrained from expressing disagreement, preferring to show more friendliness. Another cultural dimension, context, may also be included in this discussion of expressing disagreement. In a collectivistic group environment, the rule is to refrain from open argument. Regardless of the group's mission and situation, open confrontation is generally taboo. Even in the decision-making environment established in this study, the Korean groups minimized any disagreement that might disrupt the group's atmosphere.

The results of testing of H2 (*Korean groups will send significantly more new tweets than American groups*) showed the strong propensity of Koreans toward prioritizing group goals over personal goals. The results of earlier studies indicated that collectivists respond more favorably to group goals than personal goals (Argyle et al. 1986; Elleson 1983; Mann 1980; Wallbott and Scherer 1986). This behavior surfaced again in the TMCD environment created for this study. In the task, all members were required to send and exchange tweets that would contribute positively to completion of the task. New or initiatory tweets brought more ideas and tweets that would further the cause. In working together toward this mission, Koreans were more assertive and diligent in carrying out their mission than Americans (Elleson 1983; Mann 1980).

Just as the content analysis revealed new cultural understanding and insights into use of TMCD, similar results were found in the analysis of the questionnaire responses. With the satisfaction construct, we hypothesized that the American groups would be significantly more satisfied with communication and outcomes based on the results of major studies showing the individualistic attitudes of subjects from the U.S. (Hall 1983; Hofstede 2010; Lee et al. 2007; Smith et al. 1995; Triandis and Suh 2002). However, no support was found for H5a and H5b. H5a (*American groups will experience significantly higher levels of communication satisfaction than Korean groups*) was not supported because similar levels of satisfaction with communication were recorded for the Korean groups. Te'eni (2001) reported that collectivists are more concerned with other members' experience and relationships. In the TMCD environment, this translates to frequent tweeting and satisfaction with the technology that readily allows this. The high satisfaction levels of both Korean and American groups nullified the significant showing of one over the other.

H5b (*American groups will experience significantly higher levels of outcome satisfaction than Korean groups*) was not supported because the Korean groups reported significantly higher levels of outcome satisfaction. One plausible explanation for this finding comes from the results of earlier studies on individualism and collectivism and the results of testing of the other hypotheses in this study: the easy

thumb navigation of TMCD. Korean groups may also be satisfied with communication and outcome via TMCD because it facilitates conferencing with other members, increases visibility, fosters closer relationships, and conforms with group norms. TMCD has therefore become a conduit of cultural tendencies in this group.

H6 (*Korean groups will exhibit significantly higher levels of group cohesiveness than American groups*) was supported, similar to the results in earlier reports (Tan et al. 1998; Triandis 1988; Triandis 1995). Kim et al. (2006) recognized the Korean emphasis on group cohesion and the desire not to burden the group with personal demands or concerns. In the demanding decision-making situation in this study, group cohesiveness can be difficult to achieve, but the collectivistic traits of the Korean participants prevailed.

A considerable theoretical implication of this study's findings is that many of earlier IND-COL culture-technology studies' results and major CMC findings are still relevant to this TMCD studies. The peculiarities of TMCD such as tweets, spontaneity, immediacy, and mobility are *affected* by cultural idiosyncrasies. On the practical implication, TMCD developers should practice market localization and customization for continual market growth and expansion. For example, functions to easily check others' status and connections to others would be more important in collectivistic culture than in individualistic culture; and some functions that check for one's interests, entertainment features, and *access to meeting new people* would be more important in individualistic culture. Moreover, functions that enable expressions of friendly atmosphere such as graphical emoticons would not only be more appreciated but also make group communications more efficient in collectivist culture by reducing the messages just for promoting friendly atmosphere.

6   CONCLUSION AND SUGGESTIONS FOR FUTURE STUDY

The main finding of this study is that people from a collectivistic culture demonstrated a strong desire to achieve group goals while maintaining group harmony, whereas people from an individualistic culture tended to be more focused on and interactive during ongoing group processes. The results of this study accord with those of earlier studies on the effects of individualism and collectivism on the relationship between culture and technology (Elleson 1983; Erez and Earley 1993; Mann 1980; Triandis 1988; Triandis 1995). In this study, popular communication technologies were used: Twitter and mobile communication devices. In using these new technologies, participants showed the influence of the cultural values of their nations during group tasks.

The following findings are reported in this study. Members of the Korean groups tweeted significantly more often to each other than members of the American groups. Members of the Korean groups sent significantly more new (initiatory) tweets to each other than members of the American groups. Tweets were friendlier among the Korean groups than among the American groups, and Korean groups expressed less disagreement in their tweets compared to their American counterparts. Finally, group cohesiveness was more characteristic of the Koreans than the Americans. These results support the results of earlier studies on the relationship between culture and technology and culture and computer-mediated communication involving group collaboration.

TMCD is still in the early stages of commercialization; therefore, its application and impact will require further monitoring. Future studies may address two issues: the cultural evolution of this technology, and the possibility that its impact will outweigh its cultural salience. The global information technology infrastructure has made cultural boundaries porous in unprecedented ways. This sense of a "*global digital village*" is attractive to many users of social media. This globalization and the evolution of mobile communication devices may influence people's adoption, interpretation, and use of TMCD or similar technology in future. The impact of technology development may stop or minimize the influence of culture, or cultural attributes may always prevail regardless of the impact of technology. Technology may be just a tool, or it may become a way of life. Future studies may address these questions.

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