RESEARCH ARTICLE

Effect of Using Mobile Group Chat for Social Interaction on Team Collaboration

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Abstract: The purpose of this study was to investigate the effect of using mobile group chat for social interaction on team collaboration. The forming stage of team development is the main scope of the study. Based on the literature suggesting stimulating effects of mobile group chat and social interaction on employees' positive behavior, we hypothesized that using mobile group chat (Line app) for social interaction would enhance the collaboration of teams during the forming stage. We designed a one-factor experiment with participants randomly assigned to one of the two conditions. We compared the collaboration of the experimental group (using the Line app) with that of the control group (without the Line app). We found that the group using mobile group chat generates higher levels of collaboration than the control group. Implications for the role of mobile group chat in groups are discussed.

Keywords: mobile group chat; Line app; social interaction; team collaboration

One of the great contributions of digital technology is the mobile chat app or so-called "mobile instant messaging." Individuals, as well as members of the group, can send messages instantly in the mobile chat app. Therefore, group chat app on mobile phones is one of the digital technologies that have gained significant attention nowadays. Group chat app can help increase the effectiveness in many perspectives, and it is highly popular for both work and non-work activities. Regarding work activities, team collaboration via mobile group chat or instant messaging is currently popular among employees in many organizations (Bolstad & Endsley, 2003). According to Zhang and Cranshaw (2018), group chat apps have seen considerable growth in recent years, especially for coordinating information about work. Social interaction and team collaboration are one of the prevalent benefits. Mobile chat app can enable quick, team-wide message exchange in different channels; these apps promise to minimize the frictions of group communication, particularly for distributed and remote teams (Zhang & Cranshaw, 2018).

Line app is a popular mobile messaging application (MMA) for providing instant messaging service on smartphones. Instant messaging in the Line app is prevalently popular for Thai people in various age groups Line chat app becomes the most popular messaging app in Thailand, 45 million registered social media users use Line chat app in their daily life (Wearesocial.com, as of July, 2020). We mainly

use it to chat with each other and often create a group chat with many people. It uses the Internet service to communicate the different types of text and multimedia messages between users or groups. It has also become a popular tool for marketing in businesses. Its growth has also drawn the attention of researchers to understand the implications and effects of the Line app on its user's social relationships.

Currently, many organizations in Thailand use the Line app for social interaction and collaboration among employees working in teams. Bolstad and Endsley (2003) argued that working in team tasks needs good collaboration. However, according to the stages of team development by Tuckman (1965), each stage in team development is critical for team performance. The first stage, forming, is critical for the next consequential stages of team development (Ito & Brotheridge, 2008) despite there is no guarantee for team success when a team has passed each stage. Ito and Brotheridge (2008) found that the team development process grows one stage at a time. They suggest that the prior stage of team development is causally related to the subsequent stage. Accordingly, we believe that if a team has been managed and developed effectively in the first stage, the subsequent stages and the performance of the team are likely to be enhanced. Therefore, social interaction in the forming stage, to create collaboration, is important for new members. Social interaction can help new members know one another better and encourage the building of new exchanges or collaborative relationships (Tsai & Ghosal, 1998). In the digital world, many digital tools, such as the Line app, can be used for social interaction to help strengthen and shorten the process of the first stage of team development.

Numerous studies extensively examined group chat app in many areas. For instance, Hu et al. (2004) and Wilding (2006) both investigated how chat apps can foster intimacy among friends and family. Reid (1991) examined how online chat forms social norms in online chat communities. Some studies examined the unanticipated outcomes of group chat such as a reduction in face-to-face communication and increased interruption and distraction (e.g., Cameron & Webster, 2005; Czerwinski et al., 2000; Garrett & Danziger, 2007; Iqbal & Horvitz, 2007). Many studies were conducted on chat related to employee collaboration in the workplace (e.g., Handel & Herbsleb, 2002; Herbsleb et al., 2002; Quan-Haase et al., 2005). More interestingly and recently, Hsieh and Tseng (2017) found that mobile instant messaging and emoticon increase information richness, which leads to perceived playfulness in mobile instant messaging. Consequently, the perceived playfulness enhanced social connectedness between users. It implies that using mobile instant messaging can enhance social interaction among team members.

Despite the importance of team collaboration in the forming stage as well as the prevalent benefit of mobile group chat, to our knowledge, little is known about the significant effect of using mobile group chat via Line app for social interaction during the forming stage on employee collaboration. The forming stage of team development is important in which there is a great deal of uncertainty about the team's purpose, structure, and leadership (Robbings & Judge, 2011). In this initial stage, new members meet for the first time. They have to learn many things from each other and start working together immediately and effectively. Despite the very high popularity of the Line app in Thailand, not many empirical studies have examined the effect of the Line app in this aspect.

In this study, we propose that using mobile group chat facilitates social interaction opportunities between new members during the forming stage. They had never met before or had a short amount of time to make friends before working together as a team. During this stage of team development, they can learn and understand each other or socialize via the mobile group chat before they officially start working together. Using the Line app in this study for social interaction among members before they officially start working together can create a high virtual connection between them. As a consequence, we hypothesize that using Line app for social interaction will influence higher collaboration during the forming stage among team members. Our research question is, what is the effect of using mobile group chat during the forming stage on team members' collaboration. This study is aimed to examine the effect of using mobile group chat on team members' collaboration during the forming stage of team development. The remainder of the paper is organized as follows. The next section presents the relevant literature and the hypothesis. This is followed by the methods and analysis of results. Finally, the discussion is presented, emphasizing the implications, future research, and the conclusions of the study.

Literature Review

Mobile Group Chat and Line Application

Communication has never been easier, especially in the digital era due to the development of technology and the Internet. There are many tools that employees in the organization can use to communicate for work and personal purposes. One of the most popular tools for communication is chat/instant messaging, and it can be used for group communication in the form of group chat. It is a communication between two persons via electronic device or computer (Bolstad & Endsley, 2003). Notes and messages can be sent and recorded in real-time. With the development of the digital platform, messaging applications can be installed on the smartphone. Barot and Oren (2015) stated that messaging apps have been globally popular and even becoming more popular than traditional social networks. They also put that those chat platforms offer a low-cost replacement for SMS, and now they have even been progressed into multimedia hubs that support photos, videos, games, payments, to name a few. Accordingly, Zhang and Cranshaw (2018) argued that chat apps had seen considerable growth in recent years, especially for coordinating information about work.

Mobile group chat or mobile messaging apps have become a dramatically growing part of the mobile ecosystem because of the rising smartphones and messaging apps (Ling & Lai, 2016). In 2015, nearly three billion people subscribed to chat apps worldwide (Ling & Lai, 2016). Chat apps started to be rapidly developed in the past decades. Prior to the popularity of chat apps, SMS was highly used (Barot & Oren, 2015). Chat apps gained significant popularity by the development of smartphones as well as Wi-Fi and high-speed mobile networks (Barot & Oren, 2015). By 2015, mobile chat apps, especially WhatsApp, beat SMS in popularity and usage (Barot & Oren, 2015).

In Thailand, mobile chat apps have also gained prevalent popularity. The Line app is considered the most popular mobile chat app among Thai people. According to Barot and Oren (2015), LINE (the official trademark is capitalized) is a Japanese messaging app. The initial purpose of creating Line was to respond to the Tokyo earthquake in 2011. Later it was publicly released and experienced rapid growth across Asia, especially in Thailand, Taiwan, and Indonesia. It also has official accounts for brands and publishers.

It is relatively simple to install Line. It is free to download, and very simple registration is required. It automatically identifies users by their phone numbers, and the saved contacts on the smartphone will be automatically added to the application's contact list. It also offers a dedicated content management system (CMS) browser to create and manage daily push alerts and content on the account's home feed. It also allows users to interact with content using emojis. Interactive polls and a commenting system also let users respond in text and with stickers. It combines one-to-one, one-to-many, and group communication by offering private chats, broadcasts, and group chats. It enables users to communicate asynchronously in groups in which the messages are created spontaneously or which exist over a longer period. The user's activity is triggered by events in these groups (e.g., posted messages with images and videos). Therefore, users can always be online and interacting with other users.

Line has many benefits for social interaction and collaboration, such as group chats, file sharing, and so on. It can help create social interaction between employees, and then the collaboration between the employees is strengthened.

Team Development Process

Employees working in teams are usually seen in organizations because they can accomplish tasks that individuals working alone cannot. Teams are the basic working functions in the organization (George & Jones, 2012). A team is formed as a formal group of employees who intensively interact and work together to reach a common group goal (George & Jones, 2012). Nevertheless, without effective collaboration between team members, the team may not effectively contribute to the organizational performance. Thus, understanding how teams collaborate is important.

The team development process is dynamic in which changes occur over time (George & Jones, 2012). The five-stage model of team development developed by Bruce W. Tuckman is well-known among scholars. According to Tuckman (1965), the first stage is called *forming,* in which team members meet for the first time. They try to determine the appropriate behavior within the team and create a mutual understanding of the team's goals. The common activity during this team process of forming is team orientation. The second stage is called *storming,* characterized by conflict and polarization around interpersonal issues. The third

stage is called *norming,* in which in-group feeling and cohesiveness are developed. Team members are more likely to express personal opinions. The next stage is called *performing,* in which interpersonal structure becomes the tool of task activities. Finally, the last stage of group development is called *adjourning,* in which the team disbands after having accomplished its goals.

The main scope of this study is focused on the first stage, the forming stage. As mentioned previously, this stage is characterized as a period of orientation, many things such as the boundaries of scope, processes, and roles seem to be unclear, and new team members are likely to be both cautious and optimistic about the new team (Rowley & Lange, 2007). New members will be dependent on the team leader to provide direction (Rowley & Lange, 2007). In this stage, the familiarization and time spent together between the leader and the team members are important for the next stage (Ito & Brotheridge, 2008; Wilson, 2017)in general, teams follow a predictable pattern of growth (i.e. they grow up one stage at a time. In addition, expectations and job descriptions should be clearly stated, and the behavior that the leader expects the team to exhibit should be shown by the leader. We focus on this stage because if the team is appropriately developed since the first stage, it will benefit the next stages. Hence, the forming stage of team development is vital. Careful socialization and familiarization during this stage are needed. New team members do not initially know what is expected of them and what they can and cannot do. Thus, socialization is an important process that helps new members learn the team's roles, rules, and norms (George & Jones, 2012).

Social Interaction

In this study, social interaction refers to the extent to which new team members interact with each other in terms of trust, communication, and coordination. Social interaction helps facilitate information exchange among members within an organization, and the core concept of social interaction lies in the individual's reciprocal interaction (Putnam, 1993). Therefore, establishing good social interaction networks is necessary for organizational members to foster a diverse range of knowledge required and exchange for complex tasks they need to carry out.

Social interaction between employees is important and has been found to foster collaboration and effectiveness in the team. Previously, many scholars have given a large amount of attention to social interaction between organizational members and organizational effectiveness (Alge et al., 2003; Tsai & Ghosal, 1998). Tsai and Ghosal (1998) claimed that social interaction could decrease the boundaries between employees from different departments within the same organization. They also suggested that social interaction can create the shared interests that support the cooperation between employees. Alge et al. (2003) further suggested that the quality cooperation between employees fosters organizational effectiveness and helps an organization to have sustainable power. Similarly, Pentland (2013) posited that the team's productivity could be enhanced when a team's energy and engagement were stimulated by outside formal meetings. According to MIT's Human Dynamics Laboratory led by Sandy Pentland, the data showed that communication patterns in the team are vital for the team's success (Pentland, 2013). Thus, Pentland (2013) highly advised that managers should allow employees to have more socializing time with their teammates during a break.

Mobile Group Chat for Social Interaction and Team Collaboration

In this paper, team collaboration refers to the interaction among team members where everyone works together to achieve a clear and shared aim in a specific context (Lopez Hernandez et al., 2018). Collaboration between members of the team is important for team performance. However, when the team is formed in the first stage in the team development process, each member is new to one another. They usually come from different places and have different backgrounds. They have a limited amount of time to make friends and socialize with one other before starting to work together. Consequently, a collaboration between members might be difficult because they do not feel familiar with one other. The application of social interaction before they start officially working together can help create good collaboration between team members.

According to previous empirical studies, social interaction plays an important role in employee's cooperative behavior. For example, Goette et al. (2012) conducted an experiment among Swiss soldiers to examine the effect of groups involving social interactions on members' behaviors. Results showed

that groups with a high level of social interactions affect prosocial behaviors positively. In other words, a high level of social interactions within groups causes individuals to be more cooperate altruistically with in-group members than out-group members. The results implied that social ties are an important factor in group interactions, organizations, and societies. Also, Cheng (2017) investigated the relationships among leader-member exchange (LMX) quality, social interaction, and the effectiveness of knowledge transfer in Taiwanese supervisors and Chinese subordinates in China. They found that social interaction fully mediates the relationship between LMX and the effectiveness of knowledge transfer. Social interaction can increase the effectiveness of knowledge transfer (KT). Moreover, results from Cheng's (2007) study suggested that the development of high-quality social relationships between the employees and their immediate manager is a necessary condition for KT. An organization can help increase this process by providing an environment that encourages and supports managers in building collaborative links with their subordinates. The above studies showed that social interaction is positively related to employee's collaborative behavior.

According to the significant link between social interaction and collaboration, digital technology can be used for social interaction and collaboration. Lee et al. (2016) suggested that good relationship within team members is highly associated with employees' performance individually and collectively. It may help enhance the overall performance of an organization. They further argued that a social media platform could be used as a channel for social interaction among team members. It might help contribute to beneficial reciprocal relationships between members of an organization. Another study by Naim and Lenka (2017) also found a significant positive effect of social media use in the workplace on collaboration among Gen Y employees.

Relevant to the mobile group chat, Sheer and Rice (2017) found from their survey that the use of mobile instant messaging and affordances are positively related to employee outcomes such as job performance, job satisfaction, and relational satisfaction with online bridging and bonding social capital. Similarly, Hsieh and Tseng (2017) found from their study that those who interact more often with others in their social network are more likely to feel social support, establish social connectedness, and build interpersonal relationships. They found that instant text messaging and emoticon increase information richness, which leads to perceived playfulness in mobile instant messaging. Consequently, the perceived playfulness enhances social connectedness between users. It is suggested that managing social interaction is an essential part of effective team management. The use of mobile messaging for social interaction has also been studied. For instance, Ling and Lai (2016) examined how mobile messaging apps have changed the way that people micro-coordinate. They found from their qualitative study that using mobile messaging apps facilitates communication and coordination. The apps opened up the communication sphere and provided an opportunity for expressive and instrumental interaction between people in groups. Thus, the social interaction that is created through mobile group chat can extensively enhance the collaboration quality of each team member.

The above discussion shows that the use of mobile group chats for social interaction among employees highly influences collaboration between employees in the organization. From the above empirical findings, we propose the following hypothesis:

Hypothesis: In the forming stage, a team that uses Line group chat for social interaction among team members will create higher team collaboration between team members than a team without using it.

Methods

Participants

Participants were 16 persons who volunteered to work as staff for a sports event. The sample included five men (31%) and 11 women (69%), and the majority of the participants are aged between 18–25 years old (8 persons). The number of participants was limited to the actual number of volunteers needed for the sports event being organized.

Design, Procedures, and Stimuli

This study is a one-factor (social interaction: yes (using LINE) vs. no (not using LINE)) experimental design, with participants randomly assigned to one of the two conditions. Data were collected in October 2018, during the pre-event of the Thailand Dramatic Festival (TDF) 2018. The TDF is an international dance-sport event and was organized by Thailand Dramatic Works Association on 21st

Table 1

Descriptive Statistics of the Participants (n = 16)

	Team	Liaison		Operation		Total	
		Number	%	Number	%	Number	%
Gender	Male	3	37.5	2	25.0	5	31.3
	Female	5	62.5	6	75.0	11	68.8
Age	18–25 years old	2	25.0	6	75.0	8	50.0
	26–30	1	12.5	1	12.5	2	12.5
	31–35	1	12.5	0	0.0	1	6.3
	>35	4	50.0	1	12.5	5	31.3
Education	High school	1	12.5	3	37.5	4	25.0
	Bachelor's	5	62.5	5	62.5	10	62.5
	Master's	2	25.0	0	0.0	2	12.5
Occupation	University student	2	25.0	4	50.0	6	37.5
	Professional	0	0.0	1	12.5	1	6.3
	Manager	2	25.0	0	0.0	2	12.5
	Officer	2	25.0	3	37.5	5	31.3
	Others	2	25.0	0	0.0	2	12.5
Volunteer experience	1 year	3	37.5	0	0.0	3	18.8
	>1	4	50.0	7	87.5	11	68.8
	No	1	12.5	1	12.5	2	12.5

October 2018, Bangkok, Thailand. We designed the experiment according to the real procedures of the event organization. One week prior to the start of the event, the event organizer recruited 18 volunteers for the event. After having permission from the event organizer, we contacted the 18 volunteers by phone. The assignment of the volunteers into two groups was done randomly. We randomly drew the name of each volunteer from the box. Finally, we have two groups of volunteers: the Liaison and the Operation group. The liaison group ($n = 8$) was chosen to be the experimental or treatment group, whereas the operation group ($n = 8$) was the control group. We then had the liaison group create a mobile group chat using the Line app, whereas the operation group did not have any group chat. Thus, even though all volunteers did not meet in person, members in the liaison team had a chance to have social interaction among themselves via a group chat for a week prior to the orientation day. This procedure is akin to the forming stage of team development.

A week later, the two teams were invited to join the orientation program taking place one day before the event. The orientation program was aimed to provide all the useful information of the TDF event, such as roles and rules to the volunteers, and to introduce the volunteers to the event host and for all the volunteers to meet each other face-to-face. Immediately after the introduction session, both teams played team-building games to make them familiar with each other and build team rapport among themselves. However, we used only the first game called "Know Me as Much as You Can Game" to measure the dependent variable in this study—the collaboration between team members. We used the first game because we wanted to measure team collaboration when all subjects were still new or not familiar with one another in person. We did not use the succeeding games because we wanted to avoid the contamination effect of the time they had spent and become familiar with one another. We believed that after the first game, team members started to know each other better and were more likely to have more collaborations by then. Moreover, after many games and time they have spent together, the team has likely developed to the storming stage of team development, which was out of our scope.

The first game that we used to measure our dependent variable, team collaboration between members, is called "Know Me as Much as You Can." We designed this game by adapting from other collaborative and team-building games in HR. We used this game as a proxy for team collaboration because the questions in the game are about personal information (see Appendix) in which, without prior social interaction between persons, it will take more time to gather all information. We made a list of questions about personal information, and each person must try to find answers from other team members. However, we believe that the questions that we created are not the information that will usually be exchanged in the group chat because they are personal information that are not usually asked in the group chat but rather in private chat. We believe that if each member collaborates effectively, they will find all the answers to those personal questions within a limited amount of time. Nevertheless, because each member is new to each other, without good collaboration, they will hardly be able to find answers to those personal questions. It will need a high level of collaboration between team members to find all the answers within a limited time period. The team that obtains the most answers will be the winner (the game procedure is in the Appendix).

Results

The results of the first game that we used to measure the collaboration within each team are shown in Table 2. All members, except player 7, from the liaison team (experimental group) outperformed the members in the operation team (control group). The highest score of the liaison team member was 70, and the lowest was 43. On the other hand, the highest score of the operation team was 50, and the lowest was 30. The total score of the liaison team (516) was also much higher than the operation team (340).

An independent t-test examining the mean score difference between the two teams was conducted to test the hypothesis. According to Table 3, the t-test results revealed that on average, the team using Line group

Table 2

Results of the Scores From the "Know Me as Much as You Can" Game

	Player 1	Player 2	Player 3	Player 4	Player 5	Player 6	Player 7	Player 8	Total
Liaison Team (Experiment group)	70	70	70	70	66	64	43	63	516
Operation Team (Control group)	50	44	30	45	40	42	49	40	340
Difference	20	26	40	25	26	22	-6	23	176

Table 3

Results of the Independent T-Test Comparing Means Between the Liaison Team and the Operation Team

Team	N	M	SD	F	Sig.
Liaison Team (Experimental group)	8	64.50	9.16	.25	.00**
Operation Team (Control group)	8	42.50	6.27		

** $P < .005$

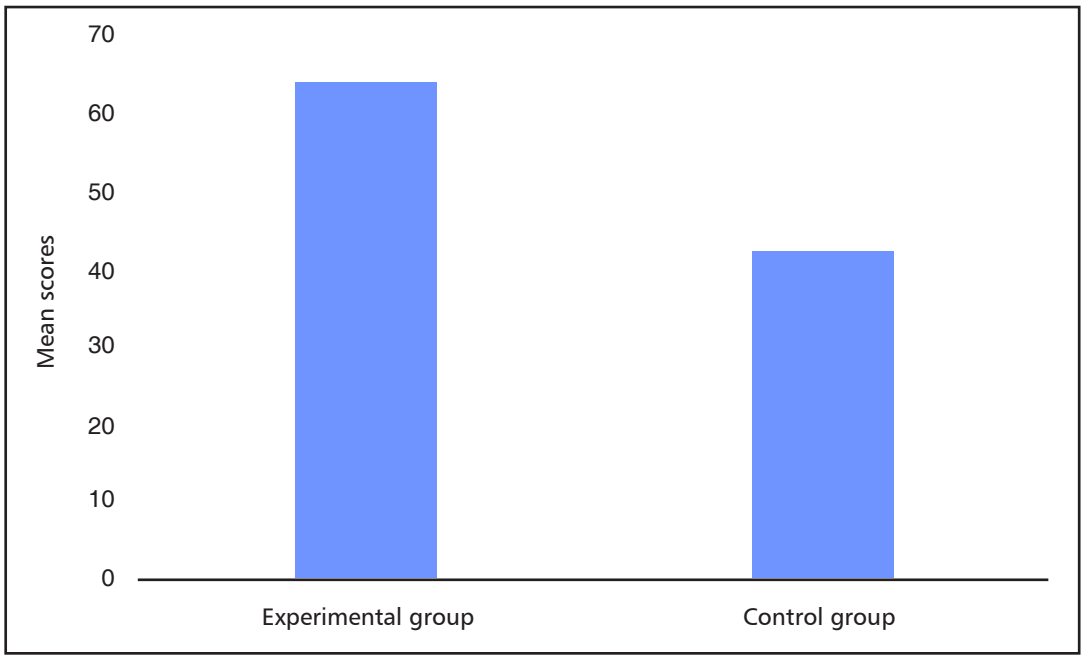

Figure 1. The Comparison Between Experimental Group and Control Group

chat had collaborated impressively better (M = 64.5, *SE* = 3.24) than another team not using it (M = 42.5, *SE* = 2.22). This difference, 22, BCa 95% CI (14.09, 29.38), was significant $t(14) = 5.60$, $p = .00$; moreover, it did represent a high-sized effect, $r = .83$.

Discussion

We conducted a field experiment among the volunteers for the Thailand Dramatic Festival (TDF) 2018. The focus of the experiment was on the forming stage of team development. We randomly assigned volunteers into two teams. One team was treated as the experimental group in which team members could communicate virtually and had social interaction via Line group chat for a week prior to the orientation day. Another team was treated as the control group in which team members did not have a Line group chat. On the orientation day, we created a game to measure team collaboration and had both teams playing the game. The results of the game showed that the experimental group that uses Line group chat for social interaction among team members during the forming stage has significantly higher total scores than the control group (Figure 1). Moreover, nearly all experimental group members have higher individual scores than members from the control group. The results supported our hypothesis, stating that in the forming stage, a team using Line group chat for social interaction among team members creates a significantly higher team collaboration between team members than a team without using it.

It can be noted that using Line group chat for social interaction among new members in the first stage of team development helps foster familiarity between them even though they have not met in person previously. This suggests that the interactive exchange of social relationships on group chats between team members encourages exchanges and cooperative behaviors at the team's forming stage (Alge et al., 2003). It is aligned with George and Jones (2012) that social interaction is an important process that helps new members learn the team's roles, rules, and norms. Similarly, Lee et al. (2016) found that social interaction helps facilitate information exchange among members within an organization. In addition, Jardan et al. (2002) also found that establishing good social interaction in the group process is necessary for organizational members to

deliver team performance. Pentland (2013) suggested that informal social interaction outside formal working hours can strengthen collaboration between employees. He adds that the team's productivity can be enhanced when a team's energy and engagement occur outside formal meetings. Results suggest that group chat apps are appropriate digital technology that employees can use for socialization outside formal working hours. Therefore, when a team is initially formed, using Line group chat can create social interaction among team members. They can know and learn from each other about the team's roles, rules, and norms faster. Finally, team collaboration will be enhanced.

The results from the experiment support similar findings from many previous studies. For instance, Cheng and Yu (2015) examined the design of simple process support systems based on collaboration engineering on university students' collaborative study. They found that a mobile meeting application designed and developed to support the students' collaborative work can improve the effectiveness and efficiency of students' group collaboration. Kim et al. (2014) examined mobile instant messaging effects on collaborative learning processes and outcomes among South Korean students. They found that high levels of social and affective interactions are found in the mobile instant messaging group. Additionally, results show that the mobile instant messaging group has better teamwork.

Goette et al. (2012) found from their experiment that groups involving a high level of social interactions have effects on prosocial behaviors such as cooperative behavior. In other words, high levels of social interaction within groups cause individuals to cooperate altruistically with in-group members than out-group members. The results imply that social ties are an important factor in group interactions, organizations, and societies. Thus, managing social interaction is an essential part of effective team management. Sheer and Rice (2017) found that mobile instant messaging and affordances were positively related to employees' affective outcomes. They also found that mobile instant messaging creates bridging and bonding social capital between employees. Hsieh and Tseng (2017) found that using instant messaging and emoticons for communication between employees fosters cooperative behavior. Additionally, they found that employees perceived the use of instant messaging joyfully.

Implications and Future Research

With respect to the theoretical contribution from this study, the forming stage of team development and social interaction is beneficial. Our study shows that during the forming stage of team development, digital tools, such as mobile group chat, create connectedness among new members even without meeting face-to-face. Even though new members have never met, they can still socialize via mobile group chat. Line chat app was employed in this study. Mobile group chat can facilitate the interactions between members. The higher the social interaction between team members, the easier and better collaboration they will have. This study has confirmed that social interaction can foster collaboration among team members.

This study provides the implication and insights for the management of the organization. Leaders can utilize digital technology, such as group chat apps, to break barriers between new members. Socialization can be stimulated even though they do not meet face-to-face. When forming a new team for a mission in the organization, management should use mobile group chat for social interaction among new members to foster higher collaboration. Moreover, we found that digital technology, such as group chat apps, can facilitate social interaction virtually during the forming stage, and thus leads to higher collaboration among team members.

Several other issues also seem worthy of future research. First, because the subjects in this study were recruited from the small sports event, the sample size included only two groups—one liaison group and one operation group. Some previous team research (e.g., Choi & Thompson, 2005; Goette et al., 2012) conducted experimental studies using many 2-3 person-teams in their studies. Future studies should try to validate this study's results by having many groups or teams in each condition.

Second, it is interesting to investigate and compare the effects of mobile group chat in teams of various characteristics. Future studies should give more concerns on team characteristics such as team size and diversity. Furthermore, the team we used in this study is a sports event volunteer team with many different characteristics from other types of teams. Thus, a future study on the effects of a mobile group chat on types of teams should also be investigated. In addition, team members' personality traits should be studied in depth. People with different traits might have different

perceptions toward group chat. Some might like to use it, but some might not. Thus, the investigation of the effects of a group chat on people with different traits will benefit the management. Finally, a qualitative method should be employed to gain in-depth or better insight into how the team members feel toward group chat for social interaction and collaboration in the team.

Conclusion

This study tries to shed some light on the effect of mobile group chat on the members' collaboration during the forming stage of team development. The forming stage of team development is important because there is a great deal of uncertainty about its purpose, structure, and leadership (Robbings & Judge, 2011). Because new members meet for the first time and start working together immediately and effectively, they have to learn many new things from each other in this stage. Using mobile group chat for social interaction can help increase the effectiveness of both work and non-work activities. Chat apps can enable quick, team-wide message exchange in different channels; these apps promise to minimize the frictions of group communication, particularly for distributed and remote teams (Zhang & Cranshaw, 2018). Our study shows that mobile group chat, such as the Line app, can be used for social interaction during the forming stage of team development. Consequently, new team members can cooperate effectively.

Declaration of ownership

This report is our original work.

Conflict of interest

None.

Ethical clearance

This study was approved by the institution.

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APPENDIX

The game "Know me as much as you can." The first stage: Orientation day

Procedure

1. Volunteers are randomly assigned into two groups: "a liaison team" and "an operation team."
2. Both teams are led by a team leader.
3. The liaison team leader creates a Line group and invites all members to join the Line group. The Line group is created five days ahead of the orientation day. The leader encourages and creates the atmosphere for social interaction by initiating chatting topic concerning both working and any general topics of their team members.
4. The operation team is not designated to create a Line group but is informed to meet with their team members on the orientation day.
5. On the orientation day, each team has eight members, including a team leader. Both teams play the game at the same time.
6. The game "Know Me as Much as You Can" is adapted from games and activities for HR collaboration. There are 10 questions, and each question has 1 point. All team members have to acquire answers to 10 questions from their colleagues. There are eight team members, so each member must try to find answers to 10 questions from the other seven members. The one who can get all the answers from all other members will get the full points of 70. Each one of them has a piece of question paper. They have five minutes to ask for all answers from other members. The team that obtains the most aggregate points will be the winner.
7. List of 10 questions are as follows:
    - Where is your hometown?
    - What is your favorite sport?
    - What is your favorite dish?
    - Named an animal that you do not like.
    - Who is your favorite singer?
    - What do you do when you have free time?
    - At what aged that you fell in love for the first time?
    - If you can choose any foreign boyfriend/girlfriend, which foreign boyfriend/girlfriend will you choose?
    - Which place, if you can choose, will you go to for your honeymoon?
    - If you can choose a magic wish, what would it be?