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# Mobile Communication Group Polarization: Effects of Communication Cues and Anonymity\*

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## Abstract

**Purpose** - The objective of this study is to identify the effects of the communication cues and anonymity on group polarization in mobile communication settings, both in terms of route and extent.

**Research design, data and methodology** - Laboratory experiments were conducted to achieve the above research objective; the effect of communication cues on group polarization with social presence as mediation and the direct effect of anonymity, social presence, and perceived cohesion were analyzed. The experiments were conducted by the participation of 240 people, who were divided into 48 groups of 5 people.

**Results** - According to the results, the difference in intergroup polarization due to communication cues and anonymity was insignificant. From this analysis, the structural equation model, communication cues and anonymity did not affect group polarization through social presence. Moreover, anonymity did not affect group polarization through perceived cohesion; however, anonymity directly affected group polarization.

**Conclusions** - This research can help to explain the discussions and the related decision-making actions on internet forums, which have recently come to the rise as well as provide foundational basis in newly establishing policies for the forums.

**Keywords:** Mobile Communication, Group Polarization, Social Presence, Perceived Cohesion.

**JEL Classifications:** D83, L86, M15.

## 1. Introduction

For years, various people have generated ideas and made decisions through discussions. Group polarization, a concept outlining that group decision-making among diverse people is more extreme than the individual decision-making of group members, has been studied in the field of social psychology. In 1961, James Stoner discovered that group decision-making, compared to individual decision-making of group members, is more risk-taking rather than selecting a stable option, and he explained that polarization phenomenon in the attitude towards the decision-making issue occurs due to group decision-making (Moscovici &

Zavalloni, 1969; Myers & Lamm, 1976). Based on this, the group polarization phenomenon was defined – generally when decision-making as a group, people are inclined to make decisions in the direction of their individual decisions (Isenberg, 1986). Since then, various research studies on group polarization have been conducted in the field of business administration, in addition to the field of social psychology.

Internet message boards are playing a central role in phenomena including candlelight vigils, an issue which has recently become significant in Korean society. When opinions of a large number of unspecified persons gather in the anonymous internet forums of portal websites, public opinion is formed through real-time dissemination, which is characteristic of internet message boards. Recently, boycott movements against firms are forming and disseminating through the internet, and in such a business setting where netizen have strong influence, research studies on the cause behind group polarization in Mobile communication situations

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are important for management activities of firms.

Nowadays, entrepreneurial activities cannot be considered under exclusion of the computer setting and the internet. All tasks of firms are handled through e-mails, messengers, intranet systems and SNS, and group discussions and group decision-making within a firm are no exception. In the global business setting of today, the form of group decision-making is transforming from the face-to-face discussions of the past to mobile communication settings. The mobile communication setting, due to its own character, has low-level communication cues and often provides anonymous settings. Thus, unlike the group polarization phenomena studied in the past, group polarization under mobile communication setting has different effects (El-Shinnaway & Vinze, 1998). A number of studies have been conducted on this subject, but most of them explained group polarization by utilizing social presence as a meditational concept. They asserted that mobile communication settings will reduce social presence in terms of group decision-making in comparison with face-to-face communication due to difference in medium (Rice, 1993) and decision-making of a different level than that of face-to-face communication will take place (Valacich et al., 1994) especially on Mobile based Social Network Services (Yardi & Boyd, 2010). However, most previous research studies focused on the difference in social presence due to difference in medium, and no study was conducted on the effect of the difference in communication cues provided to an individual within the medium of mobile communication on social presence, which in turn having an effect on group polarization.

Moreover, because mobile communication settings allow group decision-making in anonymous settings and anonymity reduces social presence (Short et al., 1976), active discussion activities are induced (Jessup et al., 1990). Based on such studies, Sia, Tan, and Wei (2002), Suh et al. (2009), and Suh (2015) explained the effect of communication cues and anonymity in mobile communication settings on group polarization through the meditational role of social presence.

Although most preceding studies claimed that social presence plays a mediational role in explaining group polarization, social presence was not measured, and therefore only indirect assumptions were possible. Moreover, the concept of anonymity was ambiguously defined, so the effect of anonymity on group polarization was not properly verified. Meanwhile, anonymity induces participants to come up with further aggressive and bolder ideas (Nunamaker et al., 1991; Sia et al., 2002) and therefore has potential to intensify group polarization. Moreover, it allows more active discussions by eliminating concerns on self-assessment (Dennis et al., 2001; Jessup & Kukalis, 1990; Nunamaker et al., 1991). Anonymity is expected to directly affect group polarization in addition to its mediational effect through social presence. Until now, no study has empirically verified the effect of anonymity on group polarization with basis in the

two – meditational and agglomerative – roles.

Thus, the main objective of this study is to positively verify and moreover compare the effect of social presence-mediated anonymity on group polarization with the effect of communication cues and anonymity itself on group polarization. Moreover, this study seeks to positively verify the meditational effect of social presence by directly measuring it.

This study was conducted by utilizing the lab experiment method. In this model, the lab experiment method was utilized for the verification of the hypotheses following the research model secured of validity through the results of exploratory research.

## 2. Theoretical Background

### 2.1. Group Polarization

Basically, excessive conformity has the risk of group think in the case of tight binding force and cohesion among group members. Group cohesiveness signifies the degree to which the members unite together. In 1972, Janis defined the concept of group think as "a mode of thinking people engage in when they are deeply involved in a cohesive in-group, when the members striving for unanimity override their motivation to realistically appraise alternative courses of action." This concept of group think later expanded into the group polarization theory.

Group polarization refers to the phenomenon that group members have a tendency to become more extreme when decision-making in a group rather than as an individual (Isenberg, 1986; Suh et al., 2009; Lee & Suh, 2009). In other words, if individuals have a strong tendency to agree on a certain topic during a group discussion, then the entire group is likely to agree more strongly once the group discussion is over; if they have a strong tendency to disagree, then the entire group is likely to disagree more strongly once the group discussion is over (Yanagihara & Koga, 2015). That is, the term refers to the tendency that the decision becomes more extreme in the same direction as the proceedings of the discussion. Thus, the group decision, on average, tends to lean towards the given direction to a certain extent. Generally, the results of a discussion further intensify in the same direction (Isenberg, 1986). It can be explained that when the group has strong cohesiveness and is shut off from the outside, a directive leader presides over the discussion, and there is pressure for a good decision to be made quickly, the situation may be mismanaged and lead to the occurrence of group polarization. In particular, in the case of small group decision-making, pressure for consensus exists, and an atmosphere in which opposition is difficult is formed. Moreover, criticism becomes taboo, and an atmosphere in

which the person breaking the rules is pressured, therefore making decision-making through constructive discussions difficult.

Group polarization also has a major impact on enterprise decision-making. On the one hand, organizations, which encourage risk-reducing innovations, are able to consider measures to promote group polarization (Argyris, 1992; Suh et al., 2009; Lee & Suh, 2009), but on the other hand, some organizations experience failure in decision-making concerning issues including venture capital investment due to group polarization (Whyte, 1993). Moreover, in addition to political decision-making (Janis, 1989), group polarization can be easily found in cases of jury verdicts (Myers & Kaplan, 1976), investment decisions (Whyte, 1993), attitude of the French people toward Americans (Moscovici & Zavalloni, 1969), and men's attitude toward sports games (Sherif et al., 1961). In this way, because group polarization may have impact – positive or negative – on the decision-making of organizations, understanding on the concept is important, and its promotion or limitation is necessary according to needs. It is likely that diverse activities on Social Network Services have varying associations with diversity level of networks (Lee et al., 2014). The new media including SNS has given users the ability to self-select information and interaction, screening out the less desirable counterpart (Hahn et al., 2015).

When examining previous studies related to group polarization, the concept, for the most part, is explained from a social presence perspective, and from these studies, the social comparison theory (SCT) (Sanders & Baron, 1977) and persuasive arguments theory (PAT) (Kaplan, 1977) are the most accepted in academia and the business world (Rajecski, 1990). Yanagihara and Koga (2015) argued that However, rare studies were conducted from the perspective of anonymity excluding Suh (2015)'s research.

For group discussions, the change in decision may be impacted, depending on the degree of persuasive argument expressions. If the opinion of group members is different from oneself during a novel persuasive discussion, then their positions will shift by the end of the discussion. PAT has two significant advantages in explaining the shift in opinion. Firstly, if given proper information, PAT can predict whether the shift will be of polarization or semi-polarization. Secondly, PAT presents a comprehensive concept in terms of individual and group decision-making as it has the same mechanism of individual or group talk.

Research on group polarization has continued to be conducted for a long period of time. Due to the characteristics of group polarization, most research has been conducted through laboratory experiments.

## 2.2. Social Presence Perspective

Social presence refers to the characteristics of the other person during interaction processes. Short et al. (1976)

viewed social presence as the inherent characteristic within communication medium and argued that the more communication cues presented, the higher the social presence (Halim & Muttaqin, 2014).

Social presence, which signifies the degree of intimacy and immediacy in regard to the organization people or oneself is affiliated with, increases satisfaction, involvement, and interaction (Lombardo & Ditton, 1997). As the degree to which individuals feel warmth among people, social presence can also be viewed as the degree of interaction with other people (Short et al., 1976).

Situations of high social presence help other people to become recognized as members of society. Social presence is influenced by various factors whereas it mostly is not influenced by the setting of communication medium (Short et al., 1976). However, by interacting with other members, social presence heightens while beginning to build social relationships (Carlson & Zmud, 1999).

Change in social presence also impacts group communication. For example, in situations of low social presence, people tend to act for personal rather than group interest (Walton & McKersie, 1965), and consensus is difficult to reach (Lewicki & Litterer, 1985).

## 2.3. Anonymity Perspective

Anonymity refers to the state that the identity of each person is unknown among the participants (Pfitzmann & Kohntopp, 2000), and in Group Support Systems(GSS)-related studies, the terms signifies the state that the group members cannot verify the source of the messages they receive and the destination of the messages they send and moreover the extent that they are free from the fear of social assessment and punishment (Pinsonneault & Heppel, 1997).

Anonymity is largely classified in two ways. The first is classification into process anonymity and content anonymity, and the second is the one into technical anonymity and social anonymity (Haines, 2005). In the first case, process anonymity is when it is not at all known who is presenting and who is not presenting an opinion. Meanwhile, content anonymity refers to when which opinion came from whom is unknown. Research on content anonymity was carried out in most studies (El-Shinnway & Vinze, 1998; Sia et al., 2002).

Lastly, anonymity can be classified into group anonymity and individual anonymity. Group anonymity refers to when the participants of a groups do not know the other members, and in this situation, individuals lack social belonging. Individual anonymity is when members of a group have a discussion without knowing each individual and his identity (Usman, 2015).

According to previous studies, anonymity has been studied from diverse perspectives while dealing with diverse content. According to each study, the view on anonymity is either positive or negative (Kim et al., 2014).

Research studies on anonymity have been carried out from diverse perspectives. In terms of the problem-solving ability aspect, ideas of greater number and variety were derived in anonymous discussions as opposed to those in which identities were disclosed (Connolly et al., 1990; Jessup & Transik, 1990; Wilson & Jessup, 1995; Shepherd et al., 1996; Gallupe et al., 1997; Pissarra & Jesuino, 2005), and on the contrary, the opposite was found as well (Jessup et al., 1990; Valacich et al., 1992). Concerning the proximity of groups, there were even studies contending that the degree of anonymity felt by the user is greater when groups are separated from each other (Jessup & Transik, 1990). In terms of the tone related to assessment, there are studies asserting that more opinions that are critical were brought up in anonymous discussions (Connolly et al., 1990; Jessup & Tansik, 1990; Jessup et al., 1990). In regard to discussion groups, a greater number of ideas were derived in bigger groups, but this did not have an effect in perceived anonymity (Valacich et al., 1992). Moreover, anonymity offered contradictory results in regard to the satisfaction of discussion participants. There were cases when satisfaction was higher in anonymous group discussions (Jessup & Tansik, 1990), and there were cases when satisfaction was higher in discussions in which participants disclosed their real-names (Connolly et al., 1990; Valacich et al., 1992). There were also studies with results where perceived utility was higher in anonymous situations (Jessup & Tansik, 1990).

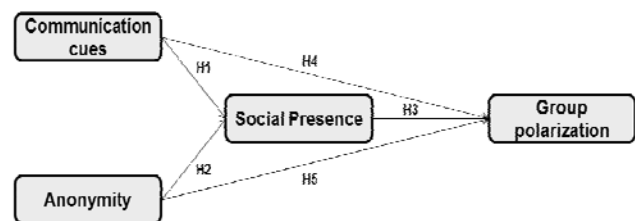
Zimbardo (1969) studied the effect of crowd psychology on the psychological conditions of individuals and summarized the findings into the theory of deindividuation. In his publication, Le Bon (1895) discovered the background leading to crowd psychology and the association between crowd psychology and individual psychological conditions. Such discovery laid the foundation for the deindividuation theory. The theory can be defined as the psychological state that causes uncontrolled actions as self-assessment and responsibilities are reduced (Festinger et al., 1952; Zimbardo, 1969). The deindividuation theory has to do with the factors that change the perception on oneself and others as well as ease the control over action. When the degree of control over action is reduced, individuals tend to behave inappropriately – that is, of selfish, greedy, authoritative, belligerent, lustful, and destructive conduct. In other words, it refers to the psychological state when an individual joins the public or big group and signifies the maintaining of concurred opinion achieved through social free-riding on public effort. Moreover, the theory identifies the external factor leading to deindividuation as anonymity and the internal factor as sense of responsibility. In terms of anonymity, individuals become shrouded in the crowd or feel as if they are in disguise or wearing or mask when having discussions without identifying all the members or individuals because no one can be assessed, criticized, judged, or punished. In terms of sense of responsibility, people are

bound to be responsible for all their actions, but if there is a situation in which one is not responsible, then he or she tends to easily behave in a socially inappropriate way.

### 3. Research Model and Hypotheses

#### 3.1. Research Model

In discovering the factors that impact group polarization, this study will compare the effects of communication cues and anonymity mediated by social presence with the direct effect of anonymity.



<Figure 1> Research model

Most existing research studies related to mobile communication examined how communication cues and anonymity influence group polarization under mobile communication settings in comparison with face-to-face ones. Therefore, in order to examine the effect of communication cues and anonymity on group polarization, this study examines two situations – firstly, the effect in which communication cues intensify group polarization and secondly, the effect in which anonymity intensifies group polarization. Moreover, it compares the effect of each independent variable on group polarization with the mediational and direct effects of social presence.

#### 3.2. Research Hypotheses

##### 3.2.1. Communication Cues and Social Presence

The fundamental aspect in having discussions is that various types of communication cues affect the level of social presence and lead to change in people's action (Short et al., 1976; Williams, 1977).

Communication cues are usually classified into verbal, visual, and textual cues (McGrath, 1984). Verbal cues refer to information delivered through voice, and they are determined according to the volume and degree of speaking (Cook & Lalljee, 1972; McGrath, 1984). Visual cues include information that is visually observable and communication through facial expressions including smiling and shaking the head. Textual cues refer to all information that is written,

printed, or expressed graphically.

Meanwhile, online decision-making in our everyday life setting can be limited to mobile communication medium. Most existing research studies claimed social presence is different according to the difference in medium, but not many studies have been conducted on whether the difference in social presence has impact on group polarization only with difference in communication cues. The study by Sia et al. (2002) differentiated the common medium of mobile communication into face-to-face mobile communication and dispersed mobile communication, examined the difference in group polarization depending on the difference in visual cues, and ultimately discovered that there is a significant difference.

Social presence, which is a concept related to the effect according to communication type such as negotiation and discussion, may be viewed as communication quality (Morley & Stephenson, 1990). According to previous research studies, the higher the communication cues, the higher the communication quality, and therefore the higher the social presence and group polarization. In other words, the level of social presence differs in accordance with the level of communication cues (Sproull & Kiesler, 1986). Therefore, the following hypothesis is established:

<H1> If communication cues decrease, then social presence decreases.

<H4> If communication cues decrease, then group polarization increases.

### 3.2.2. Anonymity and Social Presence

There were also studies claiming that anonymity reduces social presence (Nunamaker et al., 1991; Short et al. 1976). Because anonymity through mobile communication provides low-risk situations for people, it changes people's actions (El-Shinnawy & Vinze, 1998). Moreover, because anonymity lowers immediacy in communication situations, it reduces social presence (Nunamaker et al., 1991).

According to various previous studies, anonymity reduces social cues (Connolly et al., 1990). Reduction in social cues reduces immediacy among people, and this in turn reduces personal relationships or the extent that people experience warmth, which is the very definition of social presence. Therefore, social presence is reduced (Short et al., 1976).

When people exchange opinions anonymously, the sense of existence decreases and social presence that individuals feel decreases accordingly. Thus, the following hypothesis is established:

<H2> If anonymity increases, social presence decreases.

### 3.2.3. Social Presence and Group Polarization

Short et al. (1976) revealed that the level of social presence has an opposite influence on the change in

individual opinion in group decision-making during communication situations. The research findings of this study suggest that group polarization and social presence have an inverse relationship. Social presence is the variable of mediated communication (Short et al., 1976). The definition of social presence signifies the degree of intimacy and immediacy and therefore increases the level of satisfaction, involvement, and social interaction (Lombard & Ditton, 1997).

Meanwhile, previous studies claimed that low social presence leads to group polarization as it causes individuals to easily shift their positions (Griffith et al., 1998). Social comparison arises in accordance with the shift in their positions. Low restriction leads people to further pursue their interests. In other words, low social presence induces intense group polarization. Therefore, the following hypothesis is established:

<H3> If social presence decreases, then group polarization intensifies.

### 3.2.4. Anonymity and Group Polarization

Because anonymity has been studied for a long time, its impact on group polarization has been explained through diverse theories. The social identity model of deindividuation effects (SIDE) is a theory that explains the effect of anonymity on group polarization by extending the meanings of the social identity theory and the self-categorization theory in reference to the deindividuation theory.

In this theory, anonymity is divided into two types according to form; the theory explains that the two perspectives – 'anonymity of group' and 'anonymity of self' – each goes through a different process and has a social effect on the discussion group.

In the case of 'anonymity of group' which exerts social effect through cognitive process, individuals become depersonalized and therefore without a sense of social belonging. Because people fundamentally have a tendency to desire of belonging in social groups, they are greatly affected by social influence. Moreover, because people further seek to be part of the group, group polarization intensifies. On the other hand, in the case of 'anonymity of self,' which exerts social effect through strategic process, individuals tend to refrain from actions that may bring about displeasure or aversion and conceal their inner thoughts in order to evade social constraints. Therefore, if his or her identity is not revealed, then an individual does not abide by the rules or act responsibly. In situations when the identity of the individual is not revealed, group polarization intensifies because social presence decreases.

According to the theories examined above, anonymity increases deindividuation and social presence. Because this can be said to directly affect group polarization, it can be said that anonymity has influence on group polarization and therefore the following hypothesis is established:

<H5> If anonymity increases, then group polarization intensifies.

## 4. Research Method

### 4.1. Experimental Design

This research study was conducted as a lab experiment, among the methods of field study. The experimental design of this study adopted a mixed design method of the repeated measurement design method and 2X2 factorial design method – the former to verify the experimental method according to the conditions of communication cues and anonymity and the latter to conduct a comparative analysis of the experimental effect among groups featuring group polarization.

For experimental design, anonymity was defined based on the classification of anonymity presented by Haines (2005), and Sassenberg and Postmes (2002), and personal identity was established in the contrary environment. The anonymous setting was defined as the environment in which no personal identification is possible. On the other hand, the identified setting was set-up as an environment where the photos and real names of the participants were provided; discussion was carried out in a mobile communication environment where the participants knew the background of each of the participants well after having each give a brief introduction of themselves.

<Table 1> Experimental method

		Anonymity	
		Identified	Anonymous
Communication cues	mobile communication with visual cues	12 groups (60 persons)	12 groups (60 persons)
	mobile communication without visual cues	12 groups (60 persons)	12 groups (60 persons)

To examine the direct effect of the independent variables of communication cues and anonymity on the dependent variable of group polarization, group comparison was conducted based on the above experimental design. In addition, data was collected through survey research to prove the mediational effect of social presence and perceived cohesion on group polarization.

### 4.2. Data Collection

Random sampling was used among the methods of sampling, and data was collected through lab experiment and survey.

This experiment was conducted for 5 weeks from January 15 2016. The subjects of this research were undergraduate

students. Only those who were accustomed to the Facebook messenger, an mobile communication program by Facebook which had been selected as the medium for this research, prior to the experiment were qualified as the subject for this study. 30 people participated in pilot test, and 240 people participated in the actual experiment and 10,000 won was paid to each of the subjects to induce the subject to accomplish the given task and place his/her utmost efforts in the experiment.

Facebook messenger, the universal and popular program, was used as the tool specific tool for mobile communication. To provide the condition of anonymity, in the identified setting, the picture-share function was used for photographs instantly taken with a digital camera at the experiment venue to allow see one another's faces. Moreover, the real-names of the subjects were used as the nicknames on the messenger so that their names would be sufficiently known by the other participants.

## 5. Results

### 5.1. Sample Characteristics and Basic Statistics

The sampling of this study is composed of undergraduate students, and a total of 240 people participated.

The characteristics of the entire sample are listed below. The sex of the participants was almost the same for male and female. With the participation of 128 males (53%) and 112 females (47%), there is a generalized distribution of sex. In regard to age of the participants, most range from undergraduate freshmen to seniors, and 236 people (98.3%) were distributed across the teens and twenties.

As for the question asking whether the participant had been involved in a decision-making process with the same group, all 240 participants answered 'no.' This can be viewed as the result of recruiting participants without decision-making experience. In regard to the question asking whether the participant had experience with the same task, the 4 people, who answered 'yes' (1.7%) was absolutely lower than the 236 people, who answered 'no' (98.3%), it was concluded that no effect resulted from the previous experience with the choice dilemma task.

### 5.2. Reliability and Validity of Measurement Tools

#### 5.2.1. Reliability Analysis

Reliability generally refers to the possibility of attaining the same or similar measurement value when repeatedly measuring the same object or concept with independent measurement instruments that can be compared. The most frequently used method for reliability assessment is the concept of internal consistency, which evaluates how consistent the values of the items showing a single concept

are. This study used composite reliability and averaged variance extracted (AVE), which are similar to Cronbach's Alpha extracted with PLS. In general, if the composite reliability index is over 0.7 and AVE is over 0.5, measurement tools are considered reliable (Fornell & Lacker, 1981). According to the results of the reliability analysis, which is shown in <Table 2>, all the indices measuring reliability are greater than the reference value and therefore indicate that the measurement tools are reliable.

<Table 2> Results of reliability analysis

Variable	CSRI (>.70)	AVE (>.50)
Communication cues	1.000	1.000
Anonymity	1.000	1.000
Social presence	0.838	0.509
Group polarization	1.000	1.000

5.2.2. Validity Analysis

Validity refers to how accurately a researcher measured the concept that he/she seeks to measure. There are four kinds of validity: content validity, predictive validity, construct validity, and external validity. Most of the measurement tools used in this research study have been proved sufficiently of their validity through previous studies. However, construct validity needs to be measured as some of the measuring instruments have been adjusted to meet the objectives of this particular study. Thus, validity analysis was constructed based on the data collected. This research measured convergent validity and discriminant validity in order to verify construct validity.

Discriminant validity is assessed through the correlation between different concepts. If different construct variables have no correlation, the real data should also have no correlation between the construct variables. Fornell and Lacker(1981) propose to use the square root of the average variant extracted between constructs and variables in measuring discriminant validity. Each measurement item should have a greater degree of dispersion in the concept it seeks to represent than any other concept in the model, and generally if the value of the square root of the AVE is higher than the degree of shared dispersion of measurement variables and higher than 0.6, then it is said to have discriminant validity. PLS, which is used as a statistical analysis tool in this research, is a method that verifies discriminant validity is being expressed well in the relevant measurement tool. One of the criteria of this method is that the specific construct must have a greater value than the correlation value with any other constructs of the model.

In other words, the measurement value must be higher than the any other correlation value between constructs. The values used in the analysis matrix table are square root values of AVE. To secure the proper discriminant validity, the analysis value should be higher than any other value

both horizontally and vertically (refer to <Table 3>).

Convergent validity is assessed with the correlation value between measurement indices when multiple measurement indices are used in one concept. In other words, convergent validity is higher when the correlation between factors, which measure the same concept, is higher while the correlation

<Table 3> Results of discriminant validity analysis

	Communication cues	Anonymity	Social presence	Group polarization
Communication cues	1			
Anonymity	-0.000	1		
Social presence	0.056	-0.557	0.713	
Group polarization	-0.171	0.336	-0.300	1

\* Values on the diagonal are square roots of AVE values

<Table 4> Convergent validity analysis (Choice shift)

	CC	AN	SP	GP	task	work
CC	1.000	0.000	-0.085	-0.171	-0.073	-0.187
AN	0.000	1.000	-0.488	0.336	0.041	0.187
SP1	-0.039	-0.328	0.688	-0.078	-0.018	-0.189
SP2	0.098	-0.335	0.628	-0.294	-0.078	-0.379
SP3	0.050	-0.496	0.798	-0.216	-0.119	-0.322
SP4	0.039	-0.421	0.729	-0.257	-0.03	-0.255
SP5	0.019	-0.379	0.694	-0.183	-0.068	-0.302
SP6	0.099	-0.365	0.755	-0.184	-0.083	-0.253
SP7	-0.005	-0.415	0.687	-0.240	-0.086	-0.259
GP	-0.171	0.336	-0.044	1.000	0.037	0.343
task	-0.073	0.041	-0.116	0.037	1.000	0.223
work	-0.187	0.187	0.053	0.343	0.223	1.000

\* CC: Communication Cues, AN: Anonymity, SP: Social Presence, GP: Group Polarization (Choice Shift)

<Table 5> Convergent validity analysis (Preference change)

	CC	AN	SP	GP	task	work
CC	1		-0.085	-0.248	-0.073	-0.187
AN		1	-0.488	0.203	0.041	0.187
SP1	-0.039	-0.328	0.694	-0.064	-0.018	-0.189
SP2	0.098	-0.335	0.638	-0.33	-0.078	-0.379
SP3	0.05	-0.496	0.794	-0.094	-0.119	-0.322
SP4	0.039	-0.421	0.717	-0.081	-0.03	-0.255
SP5	0.019	-0.379	0.696	-0.122	-0.068	-0.302
SP6	0.099	-0.365	0.755	-0.152	-0.083	-0.253
SP7	-0.005	-0.415	0.688	-0.181	-0.086	-0.259
GP	-0.248	0.203	-0.044	1	0.024	0.298
task	-0.073	0.041	-0.116	0.024	1	0.223
work	-0.187	0.187	0.053	0.298	0.223	1

\* CC: Communication Cues, AN: Anonymity, SP: Social Presence, GP: Group Polarization (Preference Change)

between other concepts are low. In PLS, validity is analyzed by comparing the values of loading and cross loading. To evaluate how well each measurement method explains the relevant concept, some of the factors, which are below the reference value, are included, while some, which provoke significant problems to reliability, are excluded. Usually, if the value of factor loading value is over 0.5, it can be said to have convergent validity. In this research, convergent validity analysis was conducted on both choice shift and preference change. When initially conducting convergent validity analysis, all items factor loading values greater than 0.5.

### 5.3. Group Polarization Comparison among Groups

Prior to observing the path analysis through structural model, the Multivariate Analysis of Variance (MANOVA) was conducted to identify the difference between two independent variables, communication cues, and anonymity. Analysis was first carried out by discussion groups, and the average values and MANOVA results by groups are shown in <Table 6>.

<Table 6> Average values by group

Communication Cues	Anonymity	Change in Choice shift	F-Value	Sig	Change in Preference change	F-Value	Sig
mobile communication with visual cues	Identified	.450	.391	.533	.270	5.197	.024
	Anonymous	.457			.173		
mobile communication without visual cues	Identified	.447			.330		
	Anonymous	.517			.460		

The results show that no significant difference exists between choice shifts among groups (in the case of choice shifts  $F = 0.391$ ,  $Sig = .533$ ), but significant difference exists between preference changes among groups (preference changes  $F = 5.197$ ,  $Sig = .024$ ). Although difference in average values among groups did not exist, the anonymous group with no visual cues had the highest choice shift (.517) and preference change (.460) values, as established in the hypotheses. This confirmed that in an identified environment, the visual cues played no significant part, which goes against the hypotheses of this research.

### 5.4. Hypothesis Testing

Path analysis through structural model was conducted from various perspectives. All analysis was carried out with two measurement tools that show group polarization: choice shift and preference change. Before analyzing by the measurement criterions, first an analysis was conducted in terms of groups that implemented group polarization with

discussions groups of group polarization as a unit. Next, because the individual unit of analysis in directly measuring social presence and anonymity is the individual – which precisely differentiates this study from previous ones, path analysis was conducted through structural model with individual group polarization values for a more accurate data analysis of group polarization. Furthermore, for additional analysis, anonymity was separated into two parts: anonymity of group and anonymity of self.

#### 5.4.1. Group Choice Shift

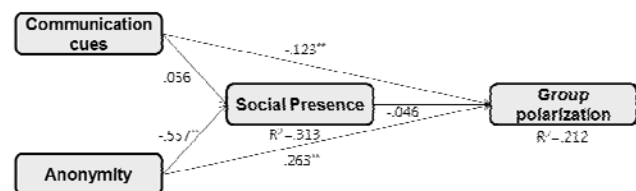
Path analysis confirmed one hypothesis. In terms of social presence, anonymity has effects on social presence, but social presence has no effect on group polarization. Also in terms of anonymity, anonymity has no significant effect on group polarization. Results are shown in <Table 7> and <Figure 2>.

Also, research showed that communication cues have no effect on social presence, while simultaneously showing that social presence has no effect on group polarization.

<Table 7> Results of hypothesis testing

Hypothesis	Path	Path coefficient	t-value	p-value	Result
H1	Communication cues → Social presence	0.056	1.017	0.310	Not supported
H2	Anonymity → Social presence	-0.557	14.170	0.000	Supported
H3	Social Presence → Group polarization	-0.046	0.599	0.549	Not supported
H4	Communication cues → Group polarization	-0.123	2.136	0.033	Supported
H5	Anonymity → Group polarization	0.263	4.248	0.000	Supported

Social presence:  $R^2 = 0.313$  / Group polarization:  $R^2 = 0.212$



<Figure 2> Analysis results of structural model

Verification of <Hypothesis 1>: <H1> the hypothesis which proposes that communication cues have effects on social presence, could not be verified as path coefficient 0.073, t-value 1.459, and significance level  $\alpha = 0.05$  conclude to dismiss the hypothesis. This is because the treatment of the visual cues, webcams, seems to fall short in increasing social presence. Effects of visual cues on social presence depends on, much like the research conducted by Sia et al. (2002), whether the participants are voicing their opinions to



others with a face-to-face or dispersed discussion method.

Verification of <Hypothesis 2>: <H2> the hypothesis which proposes that increase in anonymity decreases social presence, was verified with a path coefficient -0.477, t-value 10.983, and significance level  $\alpha = 0.01$ . Similar to many preceding researches showing that anonymity has a negative correlation with social presence, this research study has verified the same. This is because in an anonymous situation, people can neglect the fear of how others think of themselves, which in turn lowers social presence.

Verification of <Hypothesis 3>: <H3> the hypothesis which proposes that decrease in social presence, increases group polarization, was dismissed as shown in result values of path coefficient 0.011, t-value 0.012, and significance level  $\alpha = 0.05$ . This suggests a new point of view from existing studies which utilized the meditational role of social presence as the theoretical background for explaining group polarization. This result could especially be a rebuttal to conjectures claiming that the difference in communication cue medium and anonymity affects social presence and utilizing this as a meditational variable to explain group polarization as a whole.

Verification of <Hypothesis 4>: <H4> the hypothesis which proposes that decrease in communication cues increases group polarization, was supported as result values were shown as path coefficient -0.123, t-value 2.136, and significance level  $\alpha = 0.05$ .

Verification of <Hypothesis 5>: <H5> the hypothesis which proposes that increase in anonymity increase group polarization, was dismissed as result values were shown as path coefficient 0.099, t-value 1.154, and significance level  $\alpha = 0.05$ . Similar to how H1 and H3 from the perspectives of social presence and perceived cohesion were dismissed, using group analysis to confirm the correlation between anonymity and group polarization seems to be an inadequate method of analysis.

#### 5.4.2. Group Preference Change

This time, a structural model was established with preference changes in group unit level of analysis. Path

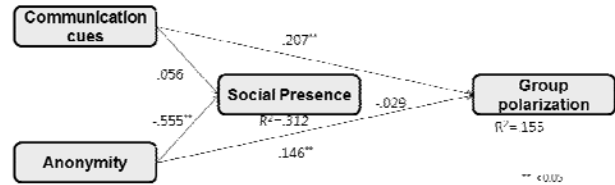
<Table 8> Results of hypothesis testing

Hypothesis	Path	Path Coefficient	t-value	p-value	Result
H1	Communication cues → Social presence	0.056	1.009	0.314	Not supported
H2	Anonymity → Social presence	-0.555	14.638	0.000	Supported
H3	Social presence → Group polarization	-0.029	0.322	0.747	Not supported
H4	Communication cues → Group polarization	-0.207	3.581	0.000	Supported
H5	Anonymity → Group polarization	0.146	2.009	0.045	Supported

Social presence:  $R^2 = 0.312$  / Group polarization:  $R^2 = 0.155$

analysis through the structural model confirmed one hypothesis. In the social presence point of view, anonymity affects social presence but social presence fails to have effect on group polarization. Even in the anonymity point of view, anonymity fails to affect group polarization. Details are shown in <Table 8>.

However, communication cues were found to have no effect on social presence, while social presence was found to have no effect on group polarization.



<Figure 3> Analysis results of structural model

## 6. Conclusion

### 6.1. Results

The purpose of this study is to find how much effect communication cues and anonymity have on group polarization by dividing into two hypotheses: first, how communication cues strengthen group polarization using social presence as its parameter, and second, what kind of parametric and direct effect anonymity has on group polarization. This study also seeks to compare the parametric and direct effect anonymity has on group polarization. To achieve these goals, data based on surveys and tests in the lab were used with PLS for a structural equation modeling (SEM) analysis, testing hypotheses and measurement tools.

The results of this research, in detail, are as follows.

Firstly, the study tried to verify the effects communication cues had on group polarization in mobile communication settings. Preceding researches have claimed that difference in group polarization occurs based on the different mediums for communication cues. However, this research, even within the same medium of mobile communication settings, focused the difference of visual cues and their respective effect on social presence which in turn could affect group polarization. However, the results indicated that the difference in communication cues had little effect on group polarization. In particular, results turned out that visual cues had little effect on social presence in the structural equation modeling analysis.

Secondly, the study empirically observed how anonymity affects group polarization from the point of views of social presence and perceived cohesion. The widely studied hypothesis in previous studies – anonymity affects social presence which in turn affects group polarization –was

dismissed. In more detail, anonymity had a strong negative correlation with social presence, but social presence had little effect on group polarization. This could be an example of a rebuttal of the widely known theory of a large number of existing studies that social presence can explain group polarization.

Thirdly, the study empirically verified how anonymity directly affects group polarization. Anonymity enables deindividuation and freedom from social constraints for individuals in group discussions. This makes people behave differently and become extreme in their decisions. This is an example of a new point of view in explaining the direct correlation between anonymity and group polarization, different than that of existing studies that only tried to indirectly correlate anonymity with group polarization through social presence.

Lastly, through additional analysis, the study differentiated anonymity by its effect on individuals to see what effects it has on group polarization. Anonymity was divided into 'anonymity of group' and 'anonymity of self' based on the SIDE theory, and their respective effects on group polarization were analyzed. The results indicated that both cases had less of an effect compared to the anonymity at large. However, in direct comparison with each other, anonymity of self had more direct effect on group polarization than anonymity of group because the former felt anonymity to a greater extent than the latter.

## 6.2. Implications

The theoretical implications are as follows:

Firstly, the study established a fundamental understanding of different factors that affect group polarization. While preceding research studies focused only on either cognitive or social characteristics to validate media effects, this study proved that in terms of group decision-making, all factors – cognitive, social, and psychological – need to be accommodated comprehensively to fully understand the

correlation among factors.

Secondly, the study suggested an integrated research framework on anonymity and its effects on group polarization. Existing research studies have focused on only one point of view of the effects of anonymity on group polarization through group comparison. Meanwhile, this research study observed the effect from various aspects and therefore allowed a new point of view in anonymity-related studies in explaining the group polarization phenomenon.

Thirdly, it attempted to fully understand and therefore validated the process of how anonymity affects group polarization. This research study divided anonymity into two types – anonymity of group and anonymity of self – and analyzed the difference in their effects on group polarization. This will provide a new dimension in approaching the effects of anonymity on group polarization.

The practical implications are as follows:

Firstly, based on its results, this research study was able to provide clues for business organizations to design the most appropriate media conditions and preemptive social conditions and therefore implement when making group decisions through mobile communication, in order to maximize achievements, come up with amicable agreements, or actively share information. Nowadays, firms rely more heavily on communication activities when decision-making through communication within the organization. Therefore, there is also growing interest in the method to carry out online discussions. This research can be useful in designing such discussions.

Secondly, this study can be useful in analyzing different adverse effects generated through internet use. Group polarization is a phenomenon in which both positive and adverse effects co-exist in group decision-making. This research can help to explain the discussions and the according decision-making action on internet forums, which has recently come to the rise, as well as provide foundational basis in newly establishing policies for the forums.

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