



Development of Methods to Enhance Staff Members' Chats in Refresh Areas in Workplaces for Encouraging Their Knowledge Sharing

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Abstract. The purpose of this study is to develop the method to encourage organizational members to chat with each other in a refresh area in workplace for fostering their knowledge sharing. First, authors focused on their chat-topics and developed the method to induce their chats on expected topics with applying a big-sized display. The result of the experiment to examine the effectiveness of proposed method showed that the proposed method would be effective on members familiar with each other, on the other hand not effective on members unfamiliar with each other. Next, authors looked the problem that unfamiliar members hardly talk to each other in a refresh room, and developed the method to encourage members to talk with unfamiliar members each other with applying smile recognition and a display. The pilot experiment to examine the effectiveness of that method was conducted and the expected effects were observed in some extent. Furthermore, some improvable points of the experimental procedures were found.

Keywords: Knowledge sharing · Informal communication · Refresh areas

1 Introduction

It is believe as a common sense on business administration sciences that informal communication among staff members is important for knowledge sharing in the organization. Therefore, on many organizations, it is often practiced to improve environments of refresh areas so that more members can get together, be relaxed and talk with each other more openly in order to encourage their knowledge sharing.

However, there are following limits of those practiced methods:

1. Members do not always talk about topics related to their jobs and connected to enhancing knowledge sharing among them.
2. In most case, refresh-areas-chats are only held among members who have a friendship or good relationship with each other. That is, it is rare to occur members' chats across the boundary of their daily communities.

Therefore, the purpose of this study is to develop the method to solve these problems and evaluate the effectiveness of the developed method.

2 Development of a Method for Promoting Staff Members' Job-Related Chats

2.1 Hypothesis

Process of Emerging a Chat. The general process of emerging a chat among members can be hypothesized as following; first, any information that can be a seed of the chat-topic come into the scene and be recognized by person "A". After that, anything associated to that information in A's memory will be recalled on A's mind. Then, if A has any motivation to utter, that recalled thing will be voiced. At that time, A's this utterance is just A's monologue. But, if A's monologue will be heard by anyone (called "B" here) in that place, it will lead B's recalling anything associated with A's monologue in his memory. Further if B also have any motivation to utter, B will voice his/her recalled things as a response to A's utterance. After that, A and B will hear what each voices, and further voice what be recalled in each's mind to each other (Fig. 1).

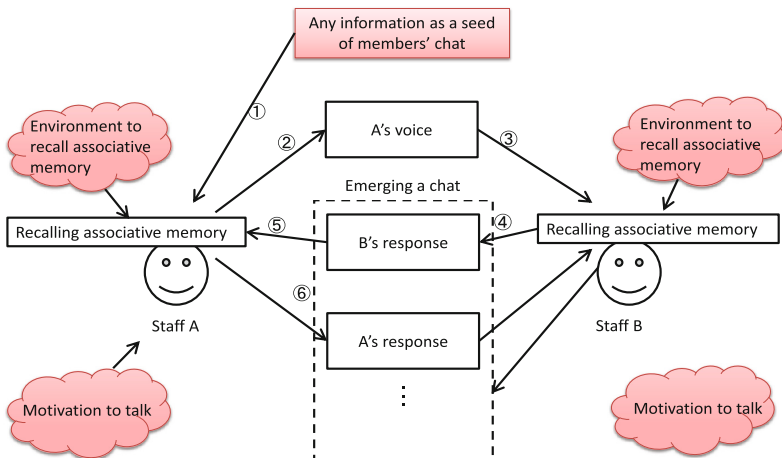


Fig. 1. The hypothesized process of emerging a chat on a topic between members.

Key Requirements for Promoting Their Job-Related Chats. According to this model, satisfying the 3 conditions as following will be required in order to promote member's chat with a specific topic:

- Seed information should be related to the topic which is expected to be talked about among members.
- Environment around members should be related to the topic which is expected to be talked.
- Members should have a motivation to voice.

Especially respecting the 2nd condition, recalled memory is believed associated semantically to what is activated in his/her mind at that time, according to a spreading activation theory [1]. If they will be in the environment where a lot of things be considered related to the expected topic, the activation level of what he/she see or hear will be heightened up unintentionally and the tendency of recalling the memory related to the expected topic will be increased. Therefore, the 2nd condition is listed up here.

2.2 Proposed Methods

Based on these conditions, the proposed method is constituted of the followings:

- A display as large as that can be seen by anyone and from anywhere in the area should be placed in a refresh area, and a lot of information related to the expected chat-topic (e.g., headlines of news articles related to the topic) should be presented on that display one by one like a slideshow, the method that could attract members' attention to the display.
- A type of the used display should be a touch panel display. If anyone touch on a presented information, the popup window will be appeared and the more detail information (e.g., the body of the news article) be presented on that display.
- The refresh area itself where the proposed display system will be placed should be as wide as that each of them should stand or take a chair near others (concretely in the range of around 1.5 m) (Fig. 2).



Fig. 2. The image of appearance of the proposed display system.

The first point mainly covers both the first and second requirement stated above. By showing a lot of information on the display, it is expected that some of those information will become a seed for a following chat. Furthermore, even though those information will not be a seed of a chat topic directly, members' memories associated to displayed information will be likely to be recalled in their mind as their memories will be in state to be activated easily by seeing the display regardless of whether or not intentionally. Because information is presented with moving like a slideshow, members who do not have what to do at that time will see the display even if they do not have such a strong interest to the information.

The third requirement is covered by the second and third points and the display size referred in the first point. The second point and the display size in the first point aim to prevent decreasing their motivation to talk to others. In workplace, some of members say that it is not so easy to speak to others because they cannot know what the others are interested in at that time and cannot find the topic about which they can enjoy talking with the others. This can be a reason that their motivation to talk to others be decreased. By the proposed method, they can share the situation that they see the same display since the display is as large as all of them can see at the same time. Therefore, if they speak to others about information presented on the display as a topic, it is likely that the others will come to talk to them. Furthermore, the function showing the popup window stated above can make the interested things of members who have touched on the display visible. That is, if a member touches on any information on the display and let the popup window shown, that information must be interesting for him/her and be likely to be a topic to enjoy a talk with him/her. Therefore, this function can be expected to prevent members' decreasing motivation to speak to others. On the other hand, the third point aims to increase members' motivation to speak to others. According to the theory of Proxemics, interpersonal distance affects human communication behavior [2], and if anyone enter one's personal space, he/she feel psychological pressure to talk to the person because entering this pace means that they have an intimate friendship with each other [2, 3]. Therefore, if it is possible to make members enter their personal area each other by setting a narrow area as a refresh area as stated in the third point, members will be motivated to talk to each other as a response to such a pressure.

2.3 Experiment

In order to examine the effectiveness of the proposal method, participant experiment was conducted in the laboratory.

Methods of the Experiment. The outline of this experiment is as following; first, the environment that can simulate the situation that members have a break time in a refresh area in workplace would be constructed in the laboratory. And then the proposed display system would be placed in that environment. In order to examine the proposed method, contents of members' chats in both of the conditions of operating the display and of not operating the display would be captured and compared to each other.

In order to simulate a situation of an actual refresh time in workplace in the laboratory, the following method was adopted: The dummy task would be prepared.

About that dummy task, participants would be directed that what theirs to do in this experiment would be to perform that task continually with taking a break time sometimes. It must be secreted for participants that the presented task be just a dummy. Also, about the purpose of this experiment, a dummy purpose was explained to them that the purpose of this experiment would be to evaluate their cognitive performance by the presented task. A 15 min break time would be placed in every 30 min task time, and a refresh room would be prepared separately from a task room too. Participants would be instructed that they can spend freely a break time in the refresh room.

Environments. The appearance of developed display system is shown in Fig. 3. Used hardware was 60 inches multi touch Full HD display named “PN-L603B” produced by Sharp corp. There were 8 tiles on the display and the information was described on each tile. Information was gathered from the internet by searching news articles with some keywords related to participants’ jobs. If participants would touch on the tile, the popup window with the body of news article would appear on the display.

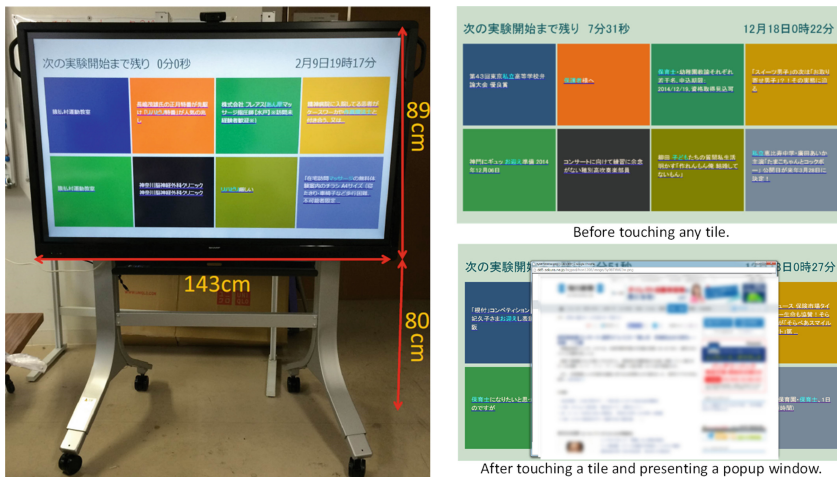


Fig. 3. Developed display system for the experiment

The constructed refresh room is shown in Fig. 4. Participants were ordered to stay in this room in a break time. On the other hand, in a task time they moved to the other room for performing a prepared task. For fulfilling the third point of proposed method, a table of which the width was around 1.5 m by 1.2 m and two chair for participants were placed on the front of the display like Fig. 4. For letting participants having the expected chairs in a break time, the experimenters sit the chairs as shown in Fig. 4 at the beginning of experiment and made participants anchor it in their mind that the chairs not been taken by experimenters should be their places.

Time Table. The time table of this experiment is shown in Table 1. While there were 5 times of a break time and a task time in Table 1, only 1st to 4th break times were targeted in this study. 0th break time was placed in order to let participants be accustomed to the

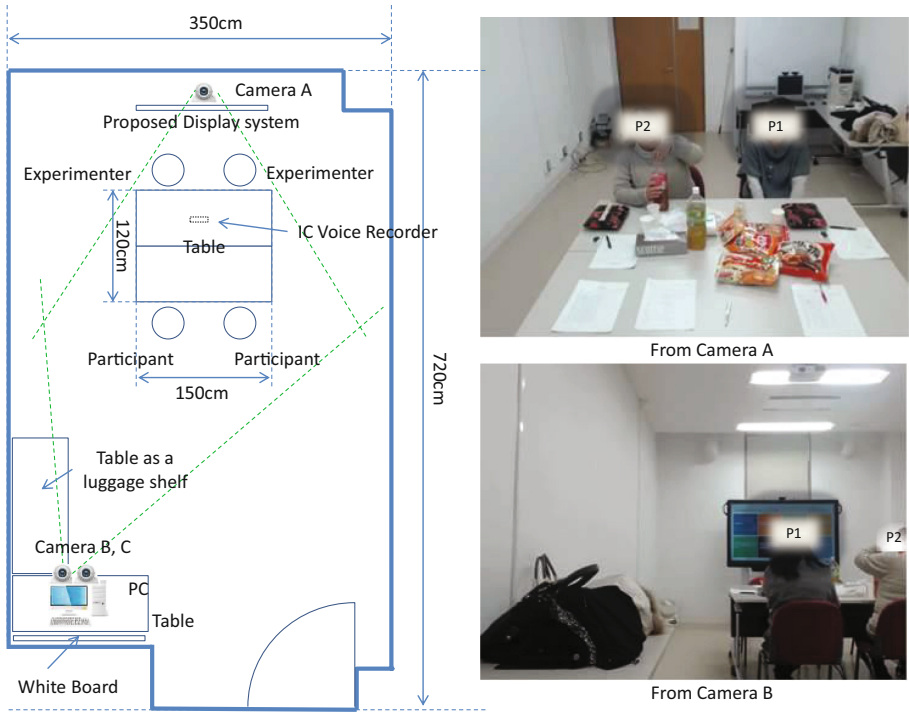


Fig. 4. The constructed refresh room for the experiment in 1st study.

Table 1. Time table of the experiment in 1st study

Time	Action	Title presented on display
10:10–10:30	Prior explanation and questionnaire	General news
10:30–11:20	Task instruction and practice	
11:20–11:35	0 th Break time	General news
11:35–12:05	1 st task time	
12:05–12:40	Lunch Time	General news
12:40–12:45	Flicker measurement	
12:45–13:00	1st Break time	No title presented
13:00–13:30	2 nd task time	
13:30–13:45	2nd Break time	Participants' job related news
13:45–14:15	3 rd task time	
14:15–14:30	3rd Break time	No title presented
14:30–15:00	4 th task time	
15:00–15:15	4th Break time	Participants' job related news
15:15–15:45	5 th task time	
15:45–16:15	Post explanation, questionnaire and interview	Participants' job related news

environment of this experiment. And also on a lunch time, they spent a time and took a lunch in this room. In each break time and a lunch time, the contents presented on the display were also shown in the right column of Table 1. The contents of general news were the hot topics at that time gathered from the internet with no relation to their job.

1st and 3rd break time were intended for a condition without the proposed method and 2nd and 4th break time were for a condition with applying the proposed method.

Participants. A pair of female childcare workers and a pair of female masseuses were participated in this experiment (the former was called Group A and the latter was Group B). Therefore, information presented on the display were related to childcare workers for the former pair and related to masseuses for the latter pair.

Note that participants were banned to use their mobile network devices like a smartphone in this experiment because of the following: If they can use their mobile devices freely and get the information related to their job from not the prepared display but their own devices, it would be unclear whether their topic choice in their conversation would be affected by the proposed method or not. Other word, Even though they would talk about their job in the condition of applying the proposed method, it would be possible that it might be caused on information gotten just by their devices. Therefore, participants were banned to use their mobile network devices in order to examine the effect of the proposed method more clearly.

Captured Data. Whole of their chat voices in the targeted break time were recorded by a voice recorder that was placed on the behind of the tabletop as shown in Fig. 4. As well as their voice, a video was also taken by Camera A and B in Fig. 4 in order to observe their behavior in a break time¹. While it was kept a secret for all of participants to record their voices and take a video until finishing the experiment in order to let them talk naturally in a break, the fact that their voices and a video had been recorded was disclosed to them in the post-experiment explanation and their allowance to use and analyze them as the experiment data was confirmed. All the participants allowed it.

Result. Recorded voices of each condition² were classified by the relatedness to participants' jobs by three persons who were not experimenters separately. If there would be a voice which the three's classifications were differed each other, they would discuss and decide to its class cooperatively. After classification, both the voices related to their jobs and not related to their jobs were countered and calculated the rate of each voice to the total number of voices in each condition in each pair.

The calculated rate of the job-related and the not-job-related in each condition in each pair were shown in Fig. 5. By Chi-square test, it was shown that there was a significant difference between the rate of the job-related and not-job-related voices in the condition of applying the proposed method (Group A), while the difference between the ratio of ones in the condition of not applying the method (Group B) was not significant.

¹ Camera C was placed for camouflaging that all cameras were just put on without operating as an equipment of the laboratory.

² The recorded data of two break times in each condition in each pair were packed to one data in the analysis.

*Chi square = 52.7, df = 1, Prob. = 3.97e-13, ****

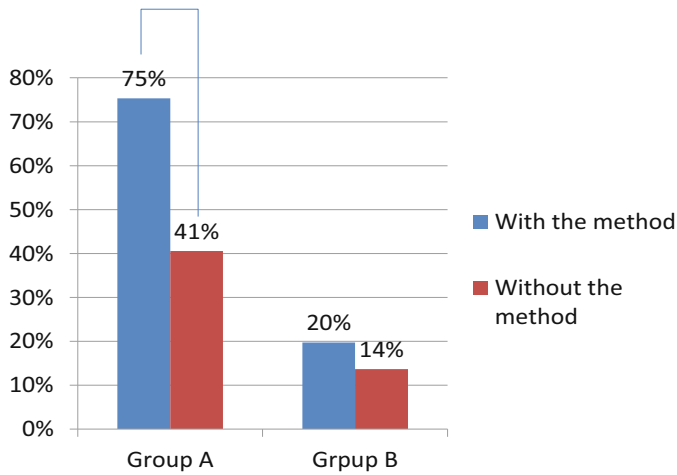


Fig. 5. The rate of participants' job-related and not job-related voices to all of their voices in the conditions with the proposed method and without the proposed method in each pair.

Respecting the differences between the results of Group A and B, it was found from the interview to them that participants in Group A met and talked with each other in daily because they worked in the same office, while participants in Group B did not meet and talk with each other so often because each of them worked usually by herself. Furthermore, from the observation of participants' behavior in a break time, participants of Group A had been talked continually without any sense of hesitation. On the other hand, participants of Group B had not been talked so frequently and easily. Both of participants Group B had looked feeling some nerves and it looked that there had been a polite atmosphere between them. It is considerable that participants of Group B had not talked so continually and naturally on any topics in the experiment because their daily relationship would not be so matured and they would feel nerves to talk easily to each other. Therefore, the reason why there was not significant difference between each condition in Group B is considered that they had not talked with each other enough to appear the significant difference in the first place because of their immature relationship.

2.4 Discussion

As a result of the experiment, the followings were found: If members in the area often talk with each other in a daily life, their chat topic would become related to information shown on the display. On the other hand, if members do not talk with each other so often and do not have a mature relationship with each other, the proposed method would not always have an effect to encourage them to talk about the expected topic.

From the first result, the first problem described on the top of this paper is expected to be solved by our proposal method. However, from the latter result, the second

problem stated above is expected not to be solved. Therefore, it is necessary to develop the method moreover that can encourage members to talk with whom they do not usually talk as the next step of this study.

3 Development of a Method for Promoting a Communication Among Unfamiliar Members Each Other

3.1 Hypothesis

We hypothesized that there would be 3 reasons why members who do not talk with each other so often in usual also do not talk with each other in a refresh area:

1. They have no relationship to each other in daily life.
2. It would be difficult to find a common topic among them about which they can enjoy to chat.
3. Since they do not know about each's characters and disposition, they cannot see from the others' behavior or expression whether it is alright to talk to them.

3.2 Proposed Method

As a solution of this problem, the method composed of two elements is proposed; preparing smile recognition snack box called "Okashi-Bako"³ and applying the display system developed in the first study stated above.

Smile Recognition Snack Box – "Okashi-Bako". This box contains snacks and paper cups for taking coffee or other beverages, which many of users of a refresh area usually want to get. This box is locked normally, and in order to open it, it is need that more than two members must show their smile face to the display and let the computer recognize their smile for some seconds long. If the computer can recognize their smiles for the set seconds continuously, the compute unlock the box and open the top of the box, and members can get snack or paper cups.

There are two expected effect of this box: The first is to show their smile each other autonomously through trying opening the box, and the second is to build the fact that they will have cooperated for one purpose.

Showing their smiles to other, according to Inoue [4] and Yoshikawa et al. [5], is believe to let others feel more friendly and attractive to them in spite that they are unfamiliar with each other. Thus after they show their smile each other, it is expected they feel more easy to talk to each other. Here, how to let them show their smile each other is a problem to be solved. As a solution to this, it is conceptualized that what many persons usually want to do or have to do in a refresh area like having a cup of coffee, eating snacks, sitting a sofa, smoking, or even entering a refresh area, should be connected to showing their smiles. Based on this concept, the smile recognition snack box illustrated above is proposed in this study.

³ While Japanese characters are different on each meaning, the pronunciation of "Okashi" has two meanings in Japanese; "funny" and "snack". "Bako" means "a box" in Japanese.

This method is also expected a countermeasure to the problem referred at first above that no-relationship among them would cause their not chatting. Through showing their smiles each other in order to open the box and get snacks, the cooperative relationship among them will be constructed. Therefore, after this operation, it is expected that they feel any relations among them and more easy to talk to each other than before.

Display System. On the other hand, the countermeasure to the second problem stated above that they cannot find a suitable topic to talk to each other is to apply the display system proposed in the first study. As already having described in the above section, the display show many information with an attractive movement. Therefore, they will see the display regardless of whether intentionally or not and sometimes they could find a topic from information on the display.

3.3 Experiment

In order to examine the effectiveness of the proposal method, participant experiment was conducted in the laboratory.

Methods of Experiment. The basic procedure of this experiment was modeled on the experiment in the first study. The environment that is similar to the situation of having a break time in workplace was constructed and the dummy task was prepared like the first experiment. Participants would be explained the dummy purpose of the experiment instead of the real purpose. However, there are some deferent points between the experiments: The design of this experiment was a between-participants one while the former experiment was a within-participants one. Furthermore, while participants continually performed the task and had a break time over around 6 h of experimental period in the former experiment, participant would perform the task and have a break time only one time actually.

Environment. The sketch map of the environment for the experiment is shown in Fig. 6. Used display in this experiment was 27 inches multi touch Full HD display called "ProLite T2735MSC" produced by iiyama corp. The width was 67 cm and the height was 41.5 cm. The blue top box on the table in the example picture from camera A in Fig. 6 was the smile recognition snack box. To open the box, participants should show their smile to the display on the steel shelf. The PC for processing smile recognition was placed behind the display. Raspberry pi 3 model B+ and servo motor were equipped on the box to open the top of the box. If the PC could succeed recognizing participants smile for 3 s, the PC would send the message to Raspberry Pi to open the top of box through Wi-Fi, and then Raspberry pi would actuate the servo motor to open the top of the box.

The contents of the display designed for this experiment is shown in Fig. 7. There were four tiles and the contents were news about pops music, information of ramem restaurants and café around the institute in which the laboratory is, news related to sports and health, and news about Japanese show business. These contents themes were selected on accordance with the result of the questionnaire survey conducted before this experiment, the purpose of which was to grasp the topic about which persons can talk

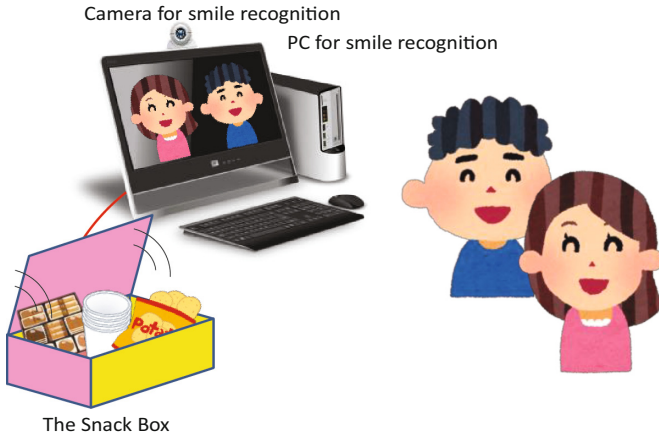
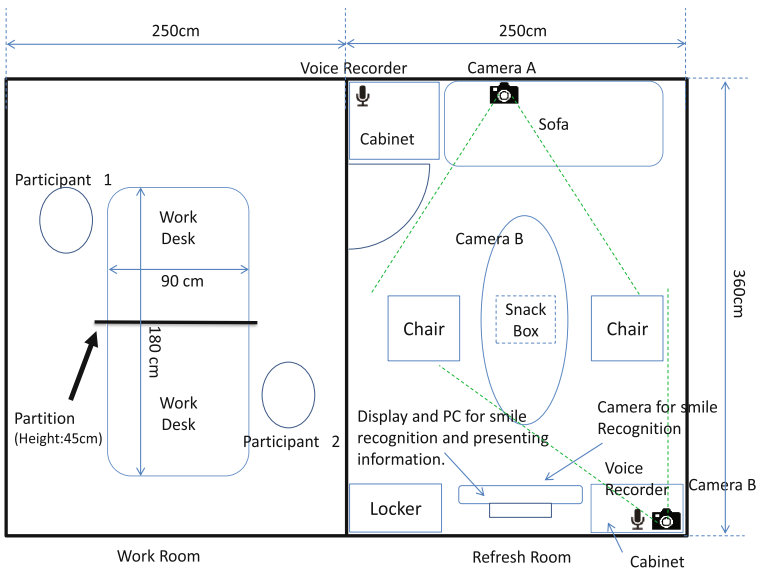
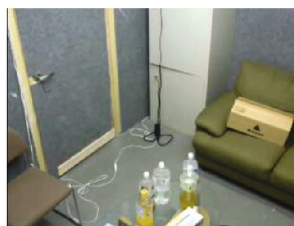


Fig. 6. The concept image of operating smile recognition snack box



From Camera A



From Camera B

Fig. 7. The constructed work room and refresh room for the experiment in 2nd study.

to others who are not so familiar with them. All the information were gathered from the internet by authors from the view point of interestingness for authors themselves.

At the beginning of the experiment in the condition applying the proposed method, the screen of the display was for smile recognition. If the smile recognition would be completed, the scree would change to the one to present the information.

Time Table. The time table of the experiment was shown in Table 2. Respecting after the break time in this table, the schedule in the left part was presented to participants at the beginning of the experiment. However, this was just a dummy. Actually, the experiment would be finished and the post explanation, questionnaire and interview were conducted immediately after the 15 min break time (Fig. 8).

Table 2. Time table of the experiment in 2nd study.

Time	Action	
10 min.	Instruction for task and prior questionnaire	
20 min.	1 st task time	
15 min.	Break time	
10 min.	Instruction for 2 nd task	Post explanation, questionnaire and group interview
20 min.	2 nd task time	
15 min.	Post questionnaire and interview	



(Red frames were not shown on actually.)

Fig. 8. Contents and appearance of the display in 2nd experiment.

Participants. Participants of this study were 13 pairs of university students. In each pair, participants were not familiar with each other. 5 of 13 pairs were in the condition that both of the snack box and the display were placed. 2 pairs were in the condition of

only placing the display and other 2 pairs were in the condition of only placing the snack box. Remained 4 pairs were in the condition neither the snack box nor the display was placed. In the conditions of not placing the smile recognition snack box, the simple snack box in which the same amount of snack and paper cups were put was placed on the table instead of the smile recognition snack box.

Here, what has to be paid special attention in this study is the influence of mobile network devices like a smartphone. If they would be allowed to use such a device, participants would gaze only their devices for a period of the experiment in order to avoid the psychological pressure to talk to each other. As a result, the proposed method would not show any effect to help them to talk with each other. Therefore, in order to examine the effect of the proposal method more clearly, such a device should be banned to be used in this experiment. On the other hand, in the actual situation of a break time, they can use any devices freely; therefore to ban them to use such a device would be so unnatural that it is possible that the result under such a situation would not be valid to be generalized. Thus, in this experiment either situation of allowing a device or one of banning a device was set as a pilot study.

Captured Data. Whole of pairs' behavior including their voices in a break time were taken a vide with keeping it a secret to them until finishing the experiment. In the post explanation, that fact was disclosed and the allowance to use the data were confirmed to each participants' group. All the participants allowed it.

Result. The recorded videos were analyzed as following processes: First, three members of authors separately observed those videos with taking a note about participants' communication and other behavior driven by their concerning about each other. After that, the effectiveness was discussed qualitatively with those notes taken before among the same three members. If necessary, videos were observed again by them together. The data from the interviews was referred in discussion.

Behavior. Respecting the result of the condition of applying both elements of the proposed method, 3 of 5 pairs had been performed the smile task to open the box. Other 2 pairs had not been performed. Those 2 pairs had been allowed to use their own mobiles. In 3 pairs having performed the smile task, it looked that they could enjoy talking with each other easily with using the proposed display well. That is, the scenes were observed many times that if their chat with a topic had been reached end, they had seen the display and they had found a new topic and stated to talk again. On the other hand, 2 pairs not performing the smile task had not used the display too because the display had not been switched from the screen for the smile task to the screen presenting information.

In the condition of only applying the smile recognition snack box, one pair had performed the smile task, while another pair had not performed. Not-performed pair had allowed using their mobiles. Performed pair had talked with each other continually until around the half of a break time after performing the smile task, but in the latter half, they gradually could not have continued talking with each other. In the last part of a break time, each of them had seen other than the partner or fingered things around the room nervously. On the other hand, not-performed pair had spent a time with reading a comic or watching her own smartphone individually and without talking to each other.

In the condition of only applying the display, one of two pair, which had not been allowed to use a mobile device, had talked with each other continually during a break time without watching the display almost at all. Another pair, which had been allowed to use a mobile device, also had talked continually during a break time. However, the experiment of this latter pair had been failure because the system had been troubled around 6 min after the experiment had been started and the display had not shown any information since then. Until that trouble, this pair had seen the display though the display had not given them any chat topic. Note that they had almost not handed their smartphone during a break time in spite that they had been allowed to use it.

Respecting the condition of not applying either the snack box or the display, 3 of 4 pair had been banned to use their mobile devices and remained one pair been allowed to. One of 3 banned-pairs had started to talk with each other immediately after a break had been started and their talks had been continued with various topics until the end of a break time. The other one banned-pair also had talked during the experiment. However unlike the pair described above, their talk had been stopped every about 3 or 4 min. During such a time of their not talking, they had eaten snacks on the table, drunken beverages, read those labels or seen around the room nervously. The remained one banned pair' behavior had been similar to the second banned pair until around the half of a break time. However during the latter half of a break time, gradually they had come to talk with each other freely and naturally. On the other hand, respecting the allowed-pair, they had not talked at all during a break time. They had spent a time with watching a smartphone, taking snacks and beverages, stretching their bodies or seeing around the room nervously.

Interviews. Here, some of participants' voices, which should be remarked, are described. Related to the effectiveness of the smile recognition snack box, 4 of 7 pairs who had been in the conditions of applying this box said that the smile task had let them become easy in spite that they had been unfamiliar with each other. Two of the other three pairs referred the contents of the snack box, related to whether they had been motivated to the smile task. One of them said that they had performed the smile recognition in order to get paper cups though the smile recognition box itself had not been interesting for them. The other pair, who had not performed the smile task, answered that they had not performed because they had thought that there would have been only paper cups in the box and they had not want paper cups at that time. The last one pair who also had not performed the smile task said that it had been difficult for them to ask unfamiliar persons to perform the smile task together.

Respecting the effectiveness of the display, 2 of 5 pairs who had been in the conditions of applying the display⁴ said that they had often looked the display when their talk had been stopped. Both of them were also applied the smile recognition snack box. One of them, furthermore, said that they would be able to continue to talk with

⁴ Actually 6 pairs had been set in the condition of applying the display. However, one pairs of them, who had been applied the smile recognition snack box too, had not performed the smile task. Therefore, the display had not change from the screen for the smile task to the screen to present information. Thus, this pair was omitted from pairs who had been in the condition of applying the display here.

getting a topic from the display, if the display would be placed. On the other hand, one of the other three pairs said that they had not looked the display intentionally because they consider it would be impolite for the partners. This pair was in the condition of only the display. The other one of that three pairs said, which was also in the condition of only the display, that it was no need for this pair to see the display because they had been able to continue their chats during a break with introducing themselves and taking other topics about themselves. This pair added that they might see the display if their chats were stopped.

3.4 Discussion

As a result of the experiment, it was appeared that the effect of showing their smiles each other, which is aimed to let them feel more friendly each other and develop a good relationship, was only suggested on their interviews and not appeared as the deference of their behavior among the experiment conditions. That is expected because even many pairs in the conditions of not applying the proposed method could have started talking by introducing themselves or taking other topics rather than had been embarrassed toward the situation of staying with an unfamiliar person and had hesitated to talk.

To connect taking snacks and paper cups, which is thought of what usually to be wanted to do in a refresh room, to showing their smiles was suggested effective in some extent to promote them to show their smiles each other naturally. Because there was a pair said in the interview that they had performed that in order only to get a paper cup.

Respecting the display, it was appeared effective because it was observed that many pairs had found a topic for their chat from the display in the condition applied it, while many pairs had looked nervous and embarrassed in the condition not applied it. Furthermore, it was founded as an unexpected side effect that the proposed display would have an effect to gather participants' eyes when they did not have anything to talk. At that time participants had looked not embarrassed to that situation even though they had kept silent. This effect have 2 meanings that they can avoid to feel the stress from the situation to staying with unfamiliar person and that they can know the other person's state that he/she watch the display at that time. Resulting from the second meaning especially, they can expect that information presented on the display would be a suitable chat-topic and can talk to each other about that information. That is, the proposed display will have this ecological effect as well as the expected effect connecting associative human memories and the effect as a machine of giving a suitable topic stated in Sect. 2.

The experiment of this study was thought of insufficient to evaluate the effectiveness of the proposed method strictly. Therefore, the further experiment has to be conducted in order to examine the effectiveness of the proposal method more precisely, referring the result of this experiment.

4 Conclusion

This study consisted of 2 studies aimed at developing the method to solve the two problems related to informal communication in a refresh area in workplace; how to encourage members to talk about their jobs and how to encourage members to talk to unfamiliar members each other. As a fruit of this study, the methods applying a big-sized touch panel display and smile recognition technology were developed.

While the experiments were conducted to examine the effectiveness of developed method, it should be just a basic study only in the very controlled environment of the laboratory. Therefore, as a next work, the further experiment should be conducted under the more various conditions simulated more precisely to the real situation in a refresh room in workplace to evaluate the effectiveness more strictly. Furthermore, more practical experiment that those methods be applied to an actual refresh area in any real workplace should be done as well.

References

1. Collins, A.M., Loftus, E.F.: A spreading-activation theory of semantic processing. *Psychol. Rev.* **82**(6), 407–428 (1975)
2. Hall, E.T.: *The Hidden Dimension*. Doubleday & Company, New York (1966)
3. Nishide, K.: Architectural planning on human psychology and ecology: the distance between persons. *Archit. Pract.* **8**(11), 95–99 (1985). (in Japanese)
4. Inoue, K.: First time impressions given by facial expressions. *Bull. Living Sci.* **36**, 183–194 (2014). (in Japanese)
5. Yoshikawa, S., Nakamura, M.: Facial information and the regulation of speech behaviors. *Trans. Inst. Electr. Inf. Commun. Eng. A* **00080**(00008), 1324–1331 (1997)