論文の内容の要旨

Thesis Summary

論文題目　　Group Communication's Influence on Individual Thinking for
Idea Generation in Innovation Workshops
（イノベーションワークショップにおけるアイディア発想に対するグループコ
ミュニケーションの影響）

氏　　　名　　呂垚（LU Yao）

This research investigated the influences of group communication towards individual thinking for idea generation in innovation workshops, the generation process of these influences, and the relationship between a high-level smile and these influences. Based on these findings suggestions for workshop facilitation were derived for improving individual idea generation performance in innovation workshops.

Innovation has become increasingly crucial not only for industries, but also education, and other social aspects. Innovation workshop was widely adopted for generating innovative ideas. Group-work was considered to be quite essential for creating ideas. Many researchers focused on input factors, such as group composition, task design, competition and so forth. However, the dynamic group-work process should influence the performance of idea generation as well. Few researchers studied from this perspective. Therefore a study was needed to identify the influences group-work process wields on individual idea generation performance. For investigating group-work process, group communication is a proper resource. Specifically, it includes verbal communication and non-verbal communication. In terms of verbal communication, communication content and utterance function seem to be essential for generating group communication's influences in face-to-face group work setting. Meanwhile, as for non-verbal communication, a plethora of works focused on positive emotion, such as positive group atmosphere or positive personal mood. For observing natural occurred positive emotion, high-level of smile was a frequently used. Meanwhile, currently most researchers treated it as a fixed input factor. Nevertheless, participants' mood fluctuates

along the process in dynamic group communications. It is necessary to clarify the relationship between a high-level smile and the influence of group communication.

Moreover, despite the importance of facilitation for managing group work, few works were conducted for supporting it. Currently most studies for supporting management of group-work were concerning group supporting systems. However, research that focused on supporting facilitation was scarce. Therefore it is necessary to conduct research for supporting facilitation in innovation workshop as well.

For idea creation, analogical thinking is a crucial method. As a transposition of conceptual structure from one context to another, the superficial similarity and structural similarity were crucial for deciding the appropriateness of an analogy. This study adopted a method proposed by Kim (2015) to evaluate analogy appropriateness. And about analogical thinking based problem solving or idea generation, most researchers studied it from individual's perspective. Research about individual idea generation based on analogical thinking in a group setting is scarce.

Therefore following questions were raised for understanding the influence of group communication on individual idea generation based on analogical thinking, and for improving facilitation in innovation workshops: 1) What are the influences of group communication to individual thinking; 2) how the influences of group communication were generated during the discussion; and 3) whether high-level smile would co-occur with these influences of group communication; finally 4) what suggestion can be made for innovation workshop facilitation in order to improve individual idea generation performance. Accordingly, four research objectives were proposed to address these questions. 1) To identify influences of group communication on individual idea generation; 2) to clarify the realization process of influences of group communication; 3) to investigate the relationship between a high-level smile and the influences of group communication; 4) to present examples of possible improvement of workshop facilitation based on the findings of this study.

An experimental workshop was carefully designed for this study. First, in order to avoid the influence of personal ability difference, we designed a workshop process that contained two individual idea generation stages to find the change within one participant. Between the 2 stages, a group communication stage was arranged. Secondly,

in order to acquire real-world data, based on Blanchette & Dunbar's work, we designed a task where participants can create analogies in a setting that is close to the real-world context.

4 experimental workshops were done with 3-person groups. They were instructed to create promoting statements as much as possible based on analogical thinking in 2 stages. In the group communication part, each participant selected 2 personal best statements. And participants in the same group would share, comment, and evaluate all the 6 personal best statements, and finally chose one group best statement. After the workshop, interviews were conducted with every participant to identify their individual thinking process during idea generation.

For data process, we did two evaluations, statement evaluation, and individual evaluation. Firstly, all the statements created were evaluated from 2 aspects, superficial similarity and structural similarity (StSi). For measuring superficial similarity, the measurement of latent semantic distance (LaSeD) was used. By comparing with the average LaSeD, statements were separated into high and low LaSeD groups. Sentences with high LaSeD were defined as good sentences in this study. And moreover, if the relationship shown in the statement resembled the case issue (the target), the statement was defined as structurally similar with the target. Based on the statement evaluation results, we conducted individual evaluation. Firstly, the percentage of high LaSeD and structurally similar statement for each participant were calculated and compared with the average percentage. If the percentage is above average, participants perform well. In this way, we obtained evaluation result for the performance of every participant in two stages.

After compared the performance of the same participant between 1st stage and 2nd stage, we were able to identify the changes. Improvements were found in some participants who performed poorly in the 1st stage but well in the 2nd stage. And it is highly possible that influence from group communication between the two stages triggered the improvement. Therefore, an investigation was done with these group communications.

Before the investigation into group communication, firstly we compared the ideas

created in 2 stages. In this way, we were able to find out the changes in participants after group communication. And based on this change, by further analyzing the interview and workshop records, we found influences of group communication on individual thinking that caused the changes from the improved participants. Next, we divided the continuous group conversation into several conversation clusters by the topics so that we could identify the change of conversation content. The clusters related with each of the group communication's influences were picked out and the conversation contents in these clusters were investigated. Mechanisms of influences explaining how changes occurred were built. And by comparing all the mechanisms, some common crucial phases were identified. Based on these phases, we were able to extract generation processes for the influences of group communication.

Moreover, we used a software (Happiness Counter) to detect and calculate the smile faces from the workshop video record so that we were able to identify smile level during group communication. By comparing the smile level in each cluster with the average smile level during the entire group communication stage, we could identify clusters with high-level smiles. And by checking each influence's clusters, we were able to identify the influences of group communication with high-level smiles.

And lastly, we did a supplementary discussion on each participant's improvement process and analysis on those participants who received influences of group communication but failed to improve in this study. Based on these analyses we proposed additional conditions for the influences of group communication.

To sum up, in terms of superficial similarity, we found 5 influences might be helpful facilitating the retrieval of source objects. Regarding structure similarity, we found 2 influences. From the analyses of all the 7 different type of influences, we generalized 3 types of the generation process. And in this study, high-level smile was found related to 2 of the influences of group communication (Source Word Transfer and Domain Transfer).

And last but not lease, suggestions were discussed for facilitation in workshops so as to improve individual idea generation performance.