Collaborative reflection and individual satisfaction.

Assignment week 5 Group A4

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Reflections are often written individually at the end of a group process. Serious problems might have occurred at earlier parts in the process, which could have been resolved by having a clear, non-abstract representation and discussion about them. We propose physicalizing collective reflection on the group process at the end of a meeting. This research measures how the presence of such an artifact influences individual satisfaction with the meeting. Preliminary interviews determined what factors make a meeting satisfying. The aspects of the group process that are evaluated with the artifact are chosen through co-creation with the participants. Quantitative and qualitative data analysis determined the satisfaction before and after the intervention. The study has proven that physicalization of the reflection on the group process has a slight positive effect on the satisfaction with the meeting. The results of the study could be used to self-assess group performances in education.

• Physicalization • Collective reflection • Group process • Individual satisfaction

ACM Reference Format:

1 Introduction

You have probably experienced this at some point; Your group process is not going smoothly, but you cannot really put your finger on where it is going wrong. Maybe task division is not fair, or there is one person who does all the talking. In any case, it leaves a sour taste in your mouth, which you might want to rinse away by critically reflecting on your experiences. We know that reflecting is an essential part of the learning process, in any context [1, 2]. Not only because it allows you to derive the key insights from the activities that you performed, but also, according to Clark & Brennan, because it helps you with just this; making sense of more personal affairs, such as the interactions between group members [3, 4].

There is however one problem; these reflections are often written individually, once the project has ended (reflection on action). All of the conflicts that might have occurred during the group process, will never actually be resolved this way. Thus, by only reflecting individually, after the event, the process and outcomes of a project could suffer significantly, and the group will not reach their full potential. This, in return, has a negative effect on group members, but also on third parties, like tutors, teachers, friends, or even an entire faculty. Ultimately, the quality of education, as well as the well-being of students, will suffer from dysfunctional groups with unclear communication. Therefore, this is a problem worth looking into.

Oftentimes, the first step in smoothing out a process and resolving a conflict is to talk about it. In other words, reflecting should be done with the entire group, as opposed to individually. Furthermore, a clear, non-abstract representation should show the conclusions of these reflections. This research proposes physicalizing collective reflection on the group process at the end of a meeting. An artifact will be created to fulfill this purpose, which will be used in the field by project groups. The research will measure how this influences individual satisfaction with their meeting. To find a conclusive answer, different sub-questions are answered, like: How is collective reflection related to individual satisfaction? When are people satisfied with a group meeting? What are the possibilities of physicalizing collective reflection? What are the key elements for a good group process?

The research generates knowledge about effective communication in a group process. More specifically, it provides an innovative strategy, along with an easy-to-use tool to facilitate this strategy. This helps with reflecting

on group processes, which in return provides new insights for the people involved, such as group members, tutors, and teachers.

1.1 Related work

Group process

The group process entails how the individual members of a group work together to complete tasks. Socio-emotinal processes form the basis for group forming[5]. “They are essential for developing strong social relationships, strong group cohesiveness, feelings of trust and a sense of community among group members”[5]. Improving the socio-emotional processes can help reach the full potential of a group[5]. Furthermore, discussing how the group is functioning can help solve collaboration problems, because it helps to pinpoint the problem in the group. This can contribute to achieving successful collaborative behaviour. Additionally, it can increase group productivity, because people are more aware of their behaviour. [6].

Currently, there are not many support tools available for improving the group process through reflection according to J.Sturm[7]. Therefore she has developed a tool that is used to influence groups’ processes and behaviour. The tools are mostly visual graphics based on the division between the speaking amount of individual members during a meeting[7]. Also, S.Macheil and J.M.DIMicco have developed similar tools[8,9]. From these studies, it can be concluded that there is a behavioural change of the group members. The group members become more motivated, more focused and the speaking time becomes more evenly distributed over all the team members. The visualization tool gives them insights into what is happening during a meeting, resulting in self-reflection. As a result behaviour change occurs in the individuals [7,8,9]. Consequently, it is possible to change the social dynamics of a group with direct visualized feedback on the group’s behaviour.

In ‘The design of Peer feedback and Reflection Tools in a CSCL environment”, researcher C. Phielix and F.J. Prins et al. performed an experiment with a radar where individuals could give each other peer feedback about their productivity, influence, friendliness, reliability, and cooperation [5]. Besides this, they created a reflection tool where five reflective questions were asked. The conclusion of the study was that students found the radar helpful, but not the reflective questions. The radar did improve the group process, but not the group satisfaction. However, this is a feedback tool where the feedback is only given to individual members of the group instead of feedback as a group on the group. Currently, there is a lack of a feedback tool where individual members give feedback on the group and the group gives feedback on the group process. Our research and tool aim to fill in this currently existing knowledge gap.

Visualization

Visualization basically means to convert quantitative or qualitative data to some sort of image or object. This can play an important part in reflecting, as it transforms abstract data into something more clear and understandable. Currently, there are many tools that visualize data to promote reflection. However, those tools are mainly focused on encouraging personal reflection. The visualization tools Furthermore, the visualizations mostly consist of data converted into digital graphs, whereas our goal is to create a physical and interactive product. The visualization tools that exist today are used to look at a user’s action from a different perspective, for example taking a look at your profile from a different account to give an overview of how others see your work [10], or to provide a visualization of historical and contextual data [11]. These tools are often not very interactive, because of the fact that the visualization is usually constructed by a system just for the user to look at. The visualization is not constructed by the users themselves and can therefore be difficult to understand at times.

There are a few products on the market that physicalize data. For example, Bookly, which accumulates the time of actions users take while reading a book, like picking them up and putting them down. This helps users understand their reading patterns [12]. DayClo is another example of physicalization. DayClo uses the data of the personal schedule of a user, and converts it to an LED display on an analog clock. This enables users to immediately see the current time and their daily schedule at the same time [13]. These physicalizations get tested by deploying the product in the workspaces of the users for a couple of weeks to explore if it supports their reflections. After a couple weeks, the participants were interviewed about their opinions [12].

Reflection

Reflecting can be performed in various ways, individually or collectively, during a design process or afterward. There has been a lot of research focused on self-reflection and the benefits this can have for personal development. Reflection can improve the conceptualization of personal informatics, like gaining self-knowledge [14].

According to Schön, a collaborative design process can be seen as a reflective conversation between the designers and the design [15]. By continuously reflecting, the designer can apprehend unanticipated problems and change the design accordingly. Furthermore, they can apply this method of reflection to their group process to improve the collaboration within the group.
By transforming the reflection on the process from an individual activity to a collaborative one during the process, the insights from self-reflection from all group members can be combined. The group can detect possible conflicts earlier and find a way to resolve them. This kind of reflection has been referred to as deep learning, which is a form of learning that transforms experience into knowledge [16]. Practically, this means that the group members can learn from the reflection insights and use this knowledge in their current and future design projects.

Design case (In the making)
For the research, the participants will be presented with an artifact that consists of a blank web with categories that are divided into six different levels. In Figure …, the artifact is shown with proposed categories for a good team process. To use the artifact, each group member has a string with a unique color that can be connected to every category on the board. This creates a 'web', which represents to what extent the group is satisfied with each category.

Methods
The participants have used the artifact, as explained above, to reflect on their group meeting. After the meeting, their satisfaction with the meeting was measured and compared to data from a baseline test. A mixed-methods approach, entailing quantitative and qualitative research methods, was utilized to get a conclusive answer to the research question: *How does physicalizing collective reflection on the group process at the end of a meeting influence individual satisfaction with the meeting?* This approach consisted of interviews and co-creation sessions, which both provided rich data and much insight into group processes, and questionnaires, which allowed for a clear evaluation of the research question.

Interviews (qualitative)
To be able to measure whether meeting satisfaction changes by using the research artifact, it is important to understand what makes a meeting satisfying for this target group. To address this question, and inform the other methods, semi-structured interviews have been conducted. These interviews gathered background information, such as how often the participants had meetings, and what their role usually is. Besides this, the interviews were used to paint a picture of what makes a meeting satisfying. All of the questions and transcripts can be found in appendix [X].

Co-creation sessions (qualitative)
Because different groups might have different perceptions of what makes a good group meeting, the research artifact has been co-created with the participants of the study. We provided them with a blank web, which would be used to assess and reflect on different aspects of the process. The participants had to reach a consensus on which subjects to put on the web, and thus reflect on. This ensured that the usage of the research artifact was of relevance to the particular group and project. The subjects used in the studies can be found in appendix [X]

Questionnaires (quantitative)
The same participants as the ones doing the co-creation session have filled in a questionnaire after a regular meeting, assessing their satisfaction with the meeting. The questions in the questionnaire are informed by the results of the interviews, and presented on a Likert scale, ranging from 1 to 5 [16]. These results should provide a fairly reliable estimate of the overall satisfaction with the meeting. At this point, the participants had no knowledge of the aim of the research nor had they interacted with the research artifact. The results from the questionnaire served as a baseline on their meeting satisfaction. After doing the co-creation session and using the artifact in a group meeting, the participants were presented with the same questionnaire. This resulted in satisfaction data from a regular meeting and from a meeting where the intervention had been used. The full questionnaire can be found in appendix [X].

Measurements (new)
To recap, this study takes the following measurements: General background information on meeting experiences (interviews), more specific cases of important factors to reflect on for a particular group (co-creation sessions) and satisfaction levels for a particular meeting (questionnaires). The general information gathered in the interviews has been used to inform the questionnaire questions and cross reference the co-creation session. The co-creation session is mostly used to align the experiment with the goals of the group that is studied. The categories chosen by the group could be evaluated further if they differ largely from the interview results. The

measurements on satisfaction, resulting from the questionnaires, are used to get a conclusive answer on the research question: *How does physicalizing collective reflection on the group process at the end of a meeting influence individual satisfaction with the meeting?* Different satisfaction levels after using the artifact could indicate a relationship between collective reflection and individual satisfaction.

Participants

Interviews
For the interviews, 14 (m/f) participants were interviewed. We gave a short explanation of our concept and asked if the person was interested in participating in our preliminary user test. All of the participants are students from the Eindhoven University of Technology, majoring in Industrial Design. These individuals have done a lot of group work during their studies and are used to having meetings. At the start of the study, all of the participants were between the ages of 18 and 24 and spoke proficient English. Aside from these limits, the interviews were conducted without discrimination

Co-creation and questionnaire
Participants from the preliminary user test were asked during a face-to-face interaction whether they wanted to participate in another of our user tests with one of their course groups. 20 (m/ f) participants were recruited .
All of the participants are students from the Eindhoven University of Technology, majoring in Industrial Design. These individuals have done a lot of group work during their studies and are used to having meetings.
At the start of the study, all of the participants were between the ages of 18 and 24 and spoke proficient English.
A limitation was used for the user study, the participant should already be a group for any course. Because our study group focuses on enhancing the group's process over a longer period of time. Choosing groups that already work together would result in a more comparable meeting for most of the meetings during a project. Those meetings are more content focused than the first one, which is more about getting to know each other. Therefore the participants were chosen as a complete group.

Tasks

As stated before, the participants have performed a user test that consists of three steps; an interview, a co-creation session, and a questionnaire.

Interviews
In the interviews, the participants were asked what they found important for a meeting to be successful/satisfying. The participants only had to answer the questions to the best of their ability (The questions can be found in appendix X).

Co-creation session and questionnaires
The participants then had a meeting that represented a regular project meeting, after which they filled in a questionnaire regarding the level of satisfaction with that meeting. Next, an online meeting was set up where the participants were be able to co-create and test our design. Before the meeting, they had to decide together what categories will be put on the web to reflect on. This was done by discussing what aspects of a meeting they valued the most. The participants then had their meeting, after which they can test our concept by using the web to reflect on their experience. After the participants performed the co-creation session and tested our concept, they filled in a questionnaire regarding their satisfaction with that meeting. The answers were presented on the Likert scale (ranging from 1 to 5).

Data analysis (in the making)

Interviews

The qualitative data gathered through the semi-structured interviews has been analyzed using a thematic analysis, with the aim of finding general categories regarding meeting experiences and satisfaction. All bits of (relevant) information from all of the interview transcripts were written down on individual post-its (roughly one sentence/answer per post-it). At this point the post-its were randomly spread out over the table. We went through all of them and grouped similar answers together. Once larger clusters of answers started to form, they would be labeled, with relevant names such as “communication” or “role division”. The clustering continued until all post-its/answers were divided into categories.

The entire thematic analysis was done twice; first by two (male) researchers and later by two (female) researchers. In between rounds, the labels would be stored away, and all post-its would be randomly spread out again, to avoid any biases. After doing the analysis twice, the labels from round one and round two were compared to one another. Only the labels/categories that came back in both rounds of the analysis were saved, the other ones were discarded. In the case of this study, about 90% of the categories from round one and two overlapped. These labels/categories were used as a basis for the questionnaire questions.

Co-creation

No analysis done yet

Most likely don't need a separate analysis, unless they differ largely from the categories in the interviews.

Questionnaire

No analysis done yet

Most likely comparing the baseline results to the results with the prototype. Bar charts could be made to visually compare answers.

Findings/results (in the making)

Interviews

As stated above, after performing the thematic analysis the categories were used to construct the questionnaire. The most profound themes that were categorized using these methods regarded mindset, structure, communication and productiveness. Other themes that were discovered that were fairly similar to the major themes were preparation, role division, atmosphere and task division. These themes were later transformed into questionnaire questions such as 'how was the communication in the meeting?' and 'was there a clear role division?'. The participants got the ability to answer using the Likert scale (from 1, being for example 'very bad' to 5, being 'very good').

Co-creation

Questionnaire

Discussion

The participants were all young adults resulting that generalising the results towards other age groups is less easily possible. Because we do not know how age influences the results. Also the study has been done with groups that are not larger than eight people in total. Therefore we can not be sure that this method will work/not work for larger groups. The tests groups that were followed were groups that already have been working with each other for more then 6 weeks. Also we monitored only one meeting with the artefact. Therefore we now do not know the influence our artefact has when it is used for a longer period of time and from the first meeting onwards. Because the period of time was short and the sample size low the statistical conclusion validity is low. When more groups of different ages and groups followed over a longer period of time the validity of the of the research will improve.

Conclusion

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A APPENDICES

APPENDICES A

Improvements for the study setup:

- More participants
- Using the artifact over a longer period of time
- More concrete satisfaction measures
- Having less external influences (such as agenda points in the meeting)
- Using a physical artifact
- Richer data after using the artifact

APPENDICES B

Paper 1. Qualitative design research

The results start with describing the actual participants that were involved in the study and also how it influenced the results. They also make a clear distinction between the designers and the participants. In our study, we do not make a difference between the different participants. The results also have quotes of individuals to show more context to the findings. They have made a clear distinction between the two parts of the research. The paper also describes the behaviour of their participants and they try to generalise the results on one hand. On the other hand, they also have data from only one participant. The study is quite personal; they use the names of the participants instead of giving them a number.

For the discussion, they immediately say the biggest 'issue' and that is the validity, because of the uniqueness it will be impossible to get the same outcomes. Directly following from that they write an improved suggestion on how they would adapt the research. It is a nice bridge to the next paragraph. In the discussion, they stay close to the participant's suggestion. In the future work they mentioned which kind of research they want to do and which parts of what was mentioned in the discussion would be improved. In the conclusion, they short mention the purpose of the study again, the most important insights from the study and how they reflected on an earlier part of their study.

Paper 2. Quantitative design research

Data analysis

This paper has a fairly elaborate methodology section. However, it does not have a clear data analysis section. After explaining the research procedure, the paper dives straight into the results of the study. Each subsection in the results section does start with some introduction on how the data was analyzed, but this could have been more elaborate and clear at some points. Some tests are mentioned, but not explained.

Results/discussion/conclusion

Good usage of visuals to support the text. Some of the statistical information in the text can (at least for me) be hard to follow, but there is enough referencing to the visuals to make it more comprehensible. The results section is very long, which makes it harder to find concise answers when skimming through it. There is no clear center of attention. The paper ends with a design implications section, which could have been split into a more clear discussion and conclusion.

Paper 3 Mixed Methods

Data analysis

No clear data analysis section can be found. Although some insight is given into the process in the encoding section.

Results/discussion/conclusion

The study was evaluated in great detail, which is very insightful. It might have been useful to have some more subheadings in this section to make the information more digestible. The evaluation nicely transitions into recommendations for future prototypes and experiments. The conclusion is clear and to the point and nicely rounds off the paper.