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Reflect, Recognize, Adapt: Improving feedback structures in Group Model-Building using SCRUM retrospectives

An exploratory study of the integration of SCRUM retrospectives in the group model-building methodology

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Abstract

This inductive explorative research delves into the novel integration of SCRUM retrospectives, derived from Agile methodologies, into the Group Model Building (GMB) process. GMB, a participatory modelling method used for complex problem-solving, benefits from SCRUM retrospectives' iterative and reflective nature. Our study unveils how SCRUM retrospectives enhance GMB by fostering iterative reflection. By fostering iterative reflection, retrospectives empower participants to candidly share insights, increasing openness in dialogue and idea exchange. The retrospectives encourage equitable participation, enabling diverse perspectives to contribute effectively, thus enhancing equity in decision-making. The study involved running two Group Model Building (GMB) sessions. In the first session, a retrospective was included. However, in the second session, the retrospective was not included. Thematic analysis of data collected through interviews and field observations, reveals that there is merit to using retrospectives in GMB. This study offers a holistic perspective on leveraging SCRUM retrospectives to advance collaborative problem-solving and decision-making in GMB settings.

Keywords: Agile, SCRUM, Group Model-Building, Retrospective, Group Dynamic

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1. Introduction

1.1. Background

Research only in the past decade has been uncovering the black box that is group dynamics in Group Model-Building (Franco, Rouwette & Korzilius, 2016) through the structure given to the GMB method with scripts (Hovmand et al., 2011; Hovmand et al., 2012). Adding structure was already proposed by Andersen et al. (1997) as a necessary next step to concretely study GMB's effectiveness. However, the study argues that more insight into how the structuring of a GMB can be achieved is necessary. The structure will provide insight into Group Dynamics in GMB. There is a challenge concerning adding structure, however. As also stated by Andersen et al. (1997 p.193) *“It is difficult to execute a script fully because the exigencies of each conference dictate some amount of improvisation and ad hoc adjustment.”* Therefore, structure is necessary to conclusively study the GMB process, however, the GMB process requires adaptability.

1.2. Group dynamics in Group Model-Building

Messy problems exist where stakeholders have conflicting interests and where there is no single (re)solution to clear up the issues which source from the system's behaviour (Vennix, 1999). To tackle messy problems, the Group model-building (GMB) method was created. GMB is a group decision-making method where a group of participants collaborate with the help of a facilitator on building a model that ultimately describes the system in which these participants exist (Vennix, 1996). To overcome complexity, GMB involves all stakeholders in a collaborative modelling process. GMB aims to create consensus on the problem definition and increase understanding of the behaviour of the system that leads to this defined problem (Vennix, 1996). However, following the GMB method brings its own challenges due to group dynamics (Rouwette & Smeets 2016; Vennix, 1999).

“One of the most important challenges for the facilitator of such debates lies in dealing with factors that preclude or at least complicate such a good debate or ‘open deliberation’.” (Rouwette & Smeets, 2016 p. 129)

Examples of reasons for group dynamics challenges are, among others, insecurity due to a lack of understanding (of System Dynamics) (Hovmand, 2014), personality differences (Yildiz Durak, 2022; Beauchamp & Jackson, 2007; Richardson & Andersen, 1995), and/or power differences (van Nistelrooij et al., 2012). The facilitator is a key factor in diminishing these challenges and creating an equal playing field (Rouwette & Smeets, 2016; Vennix, 1996 p.52). Furthermore, this study argues that more support could be given to the facilitator. How exactly a facilitator knows whether he is performing well can be better supported through feedback structures in the GMB process.

1.3. Agile

This study proposes the use of Agile, or more specifically, SCRUM principles worked into the method of GMB. Agile is a method originally devised for software programming teams (Kumar & Bhatia, 2012), but has since been used in other fields such as education (Salza, Musmarra & Ferrucci, 2019). In general, Agile methodology consists of principles that provide flexibility through an iterative working process, incorporating regular feedback moments, named 'retrospectives', and ultimately delivering a fully completed project. A noteworthy agile principle for this research is the following:

"At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behaviour accordingly." (Principles Behind the Agile Manifesto, 2001).

Retrospectives in Agile provide individuals with more possibilities to improve themselves. As stated before, GMB requires adaptability and the possibility of improvisation or ad hoc changes. Agile, for both these reasons, could fit well with the GMB method.

1.4. The aim of the study

The study will aim to explore to what extent SCRUM retrospectives can improve the GMB methodology in the form of a better understanding of the group dynamic from the facilitator and in the form of the participants having a better experience overall.

Furthermore, the study aimed to deduct whether the methodology is feasible to be incorporated into the GMB method in such a way that it provides beneficial additions to the GMB methodology without interrupting the core principles of GMB. The research will also aim to provide insights into the potential limitations of using retrospectives. The

additions this research proposes will come in the form of a retrospective after each phase of the GMB. These retrospectives as well as these 'phases' will be elaborated upon later in the theoretical framework.

1.4.1. Scientific contribution

The scientific contribution of this research consists of the expansion of methodology to unravel the 'black box' that is group dynamics in GMB, as stated by Franco, Rouwette & Korzilius (2016). This research does not aim to provide more insight into group dynamics. It instead aims to expand the toolbox for Researchers of GMB. The expanded toolbox could provide more ways for Researchers to increase insights and knowledge regarding group dynamics in the GMB process. If the method provided in this research is successful in providing more insight into the group dynamics of GMB sessions, then in the future it can be used to aid in the studies into the workings of GMB sessions. Ultimately, by better understanding group dynamics, the GMB method will be improved. The main goal is to test whether the proposed methodology additions in this research are an improvement with regards to the group dynamics which may provide an improvement in the output. Crucially, it is important to note that the goal of this research is not to improve the GMB sessions' output in this research.

1.4.2. Potential benefits of adding retrospectives to the GMB methodology

Firstly, one of the benefits of the addition of retrospectives to the GMB methodology are potentially a better understanding and awareness by the facilitator with regards to the group dynamic and therefore a better learning experience for the facilitator. Secondly, it could also provide the GMB method with structure without sacrificing its dynamic and fluid nature which as previously stated is at least partially required. For example, adding a feedback moment after each phase in the GMB process may show that a phase is not fully completed yet and more time in the current phase or a previous phase, is necessary. Such insights during the session could benefit the whole process as certain issues or impediments which may arise later in the process are spotted earlier on in the GMB process.

Thirdly, and most importantly, the overall experience of the participants may improve as well, due to the added attention given to participants who, for whatever reason, have a tendency to not add as much of their knowledge and perception of the system and the messy problem. A facilitator may be better equipped to deal with power differences, knowledge differences and/or personality differences that may inhibit the freedom of speech required in GMB (Van Nistelrooij et al., 2012). The hope is that with regular feedback moments as proposed, the involvement of the participants increases.

Summarizing, the retrospectives added to the GMB method may serve as a way for our field of system dynamics to better grasp the 'black box' that is the group process/dynamic in a GMB project as mentioned by Franco et al. (2016). Facilitators and the group communicating their experience of the session up until that point in the session can provide more insight into what led the participants to have that experience. The reflection moments can increase our understanding of the group process and can validate best practices in GMB more.

1.4.3. Research question

This study will use the following research question to provide insight into the possibility of using agile methodology in Group Model-Building:

To what extent is there merit to using 'SCRUM retrospectives' in Group Model-Building to improve the understanding of the group dynamic?

1.5. Outline of the study

The study will perform two GMB sessions. One session will be incorporating the reflection concept, the retrospective, following the SCRUM methodology, which will be discussed in the theoretical framework. The second GMB session will be performed without the added reflection moment(s) to provide a comparison. The main interest is in the effects of the added feedback moments and whether the group dynamics improved after the reflection. After the GMB process, interviews with the participants and observations of the GMB sessions will generate the data. Combined, these will provide the research with more knowledge on tools to grasp the 'black box' that is the group process in a GMB.

2. Theoretical framework

2.1. SCRUM

Agile is the term for a group of methodologies. To provide this research with a clear scope in what will be used, it will focus on one of these methodologies, specifically SCRUM. SCRUM is a method that follows Agile values. Firstly, the background of SCRUM will be presented, followed by the retrospectives and finally the limitations of retrospectives.

2.1.1. Background of SCRUM

The Agile movement is a group of software development methodologies, that were bound together in the Agile Manifesto as a response to the increasing need to provide more flexibility in software development (Abrahamsson, Salo, Ronkainen & Warsta, 2017). The term agile - although little agreement on this meaning exists - refers to the adjective of agility, meaning 'nimble' or 'light-footed' (Abrahamsson, Salo, Ronkainen & Warsta, 2017). The term is no surprise, as the method aims to be flexible in its ways. The method prefers adaptability or flexibility and a focus on humans over control, strict planning, and process focus (Principles Behind the Agile Manifesto, 2001).

The SCRUM term refers to the scrum technique used in Rugby, where a team attempts to work together to retrieve the ball (Abrahamsson, Salo, Ronkainen & Warsta, 2017).

SCRUM has some key traits. The roles in SCRUM are distinctive. SCRUM does not provide any requirements for software development techniques, rather it focuses on the team of developers and how they function in a changing environment (Abrahamsson, Salo, Ronkainen & Warsta, 2017). SCRUM aims at keeping a pulse on the development process, the team and the potential impediments in the process (Abrahamsson, Salo, Ronkainen & Warsta, 2017). Rather than controlling for these at the beginning of the project, it continuously controls for shifts in the environmental and technical variables (Abrahamsson, Salo, Ronkainen & Warsta, 2017).

2.1.2. Retrospectives

In a SCRUM, there exist multiple meetings called 'events'. One of which is the retrospective, which will be discussed. The retrospective is the last event of the sprint (Schwaber & Sutherland, 2020). It is an event focused on the process, rather than on the product. The meeting aims at improving (team)work in terms of quality and effectiveness

(Schwaber & Sutherland, 2020). A typical retrospective structure has three questions for everyone in the team that are individually answered and discussed, namely: ‘what went well?’, ‘what went bad?’, ‘what could be better?’ (Schwaber & Sutherland, 2020). The development team reflects on the last sprint in terms of fulfilled tasks, individuals and processes (Schwaber & Sutherland, 2020).

2.1.3. Limitations of retrospectives

Although retrospectives aim to improve group dynamics, some potential limitations stem from using retrospectives. These limitations are important to be discussed as they can provide a challenge for the usage of retrospectives.

Firstly, one of the possible limitations of retrospectives is the lack of interest from participants due to repetition or the lack of relevance for a specific participant (Ionel, 2019; Matthies, 2019). The repetition or lack of relevance can lead to boredom. This can negatively affect the retrospectives. Participants may not be involved or actively participating, decreasing its effectiveness.

Secondly, maintaining focus on the group process can be a challenge. The retrospective is meant to reflect on the team and the team's issues (Derby, 2006). If a retrospective strays too far from the group dynamic, towards for instance the subject matter, the result can be that the group dynamic is not improved as the issues are not handled. Ultimately, this can cause the GMB output to be lacking (Rouwette & Smeets, 2016).

2.2. Group Model Building

2.2.1. Phases in the GMB process

For this study, it is necessary to provide a basis on which to separate the phases in the GMB session, after which a retrospective meeting will be held. These phases can be separated in multiple ways. The chosen method of dividing the GMB sessions in this study will be discussed in the validity chapter (Ch. 3.4.2).

First of all, the phases could be practically divided, for instance by dividing the GMB process into five sessions of a certain period (i.e. an hour) and having a retrospective meeting after each session. Doing the GMB in such a way would provide a distinctive period for each 'sprint' (the agile nomenclature for the period in which the development of

the iteration is done), however defining phases based on periods may result in uncomfortable interruptions of the GMB process as the period may end halfway through a script (Kumar & Bhatia, 2012).

A second option in how to provide the 'sprints' could be by using the general intervention methodology phases (Rouwette & Franco 2015). This distinction of phases would be along the lines of divergence, groan zone (Kaner, 2014), convergence, and review/validation (Rouwette & Franco 2015). The reason that this research will not use the division of phases based on the general phases according to GMB methodology, is that these phases can prove to be problematic due to the inherent overlap that exists in these concepts. In other words, this division of phases would lack a rigid procedure with distinct separations of phases. It would be unclear where a phase ends and where another starts (Rouwette and Franco 2015). It is not uncommon for variables to be added (divergence) to the model later in the GMB process when the model has already started to show its form (convergence), or those definitions of variables are re-discussed (groan zone) after they had been already agreed upon earlier in the process (convergence)(Rouwette and Franco 2015).

Lastly, the research's GMB sessions could use scripts as the guiding lines for the 'sprints', as mentioned in Wilkerson et al. (2020) and Hovmand et al. (2012). Using this method would provide a rigid structure with distinct sub-processes within the GMB process. The division based on scripts would provide the research with a clear beginning and end for each sub-process.

2.2.2. Limitations in the group process of GMB sessions

In the following section, the limitations of the group dynamics in Group-model building are discussed. The main issues are group dynamic issues such as power and dominance which can lead to group thinking or unused perspectives from participants.

Firstly, a limitation of GMB is the presence of dominance of vocal participants, causing less dominant participants to have less time to speak. In GMB sessions, certain more vocal participants may dominate the discussion or exert more influence due to their personalities (Beauchamp & Jackson, 2007; Richardson & Andersen, 1995; Yildiz Durak, 2022), or power differences (van Nistelrooij et al., 2012). Power can stem from, for instance,

hierarchical reasons or from expertise (Hovmand, 2014; Huber, 1999). This can result in the marginalization of other participants and their perspectives, or the complete lack of input from those participants. Too much inequality in the amount of input can raise issues such as imbalances in decision-making and potential biases in the outcomes, as well as a lack of model ownership for participants (Rouwette & Smeets, 2016).

Secondly, problems in the social dynamic can arise. Participants may feel pressure to conform to the dominant viewpoints or avoid dissenting opinions, hindering the exploration of alternative perspectives and creative solutions (Dahl, 2007). Social dynamics, such as power dynamics, conflicts, or interpersonal relationships among participants, can further influence the outcomes and hinder open and honest communication (Rouwette & Smeets, 2016). The issues in social dynamics overlap with the prior point as the effect can stem from the same source, namely power. The difference with the prior point is that the participants are directly feeling the influence. I.e. there is no room for them to talk. In group dynamic issues, there is more of an indirect force acting. The participants are not inhibited from talking, however, what they say may not be truthful as they are afraid (Dahl, 2007; Rouwette & Smeets, 2016). Another possibility is that their view may not be taken seriously by the one in power and is therefore put aside. A facilitator can prevent the latter (van Nistelrooij et al., 2012).

Thirdly, groupthink is something to be on the lookout for as well when facilitating a GMB session. Groupthink is the creativity lacking behaviour from groups due to different possible reasons, such as lack of incentive, conformist personalities or boredom due to repetitiveness (Senge, 2005). This behaviour leads to a lack of critical thinking. GMB sessions can be susceptible to groupthink. For instance, through the tendency for groups to prioritize consensus over critical thinking and thus either creating a model that is not according to their 'real' viewpoint or a model that lacks aspects of the system due to a lack of input.

All these limitations have to be taken into account when performing GMB sessions to be successful. The facilitator is crucial in the GMB process to avoid these issues as much as possible (Rouwette & Smeets, 2016; Vennix, 1996). This research studied the merit of using SCRUM retrospectives to decrease the effect of these limitations.

2.3. SCRUM and GMB, a comparison

Similarities between GMB and SCRUM exist. An example of a similarity between the methodologies is in the nature of the process. Rather than a sequential waterfall-esque approach (McCormick, 2012), GMB is a more dynamic process. A GMB process, although it has some generic process structure, is malleable in its sequence and does not require a phase to be fully complete to progress as with Waterfall (McCormick, 2012). A facilitator or the group of participants in a GMB may decide to return to an earlier phase, such as the divergence phase (Kaner, 2014) when certain aspects of the system have not been explored enough, or to the 'groan zone' (Kaner, 2014) when consensus was not reached fully.

Secondly, both methodologies work towards a single final product. The working product for SCRUM is the software product. The working product for GMB can be a model or something less tangible, such as 'agreement'/'consensus' or 'better understanding'.

Lastly, the human-centred aspect of both methods is an important similarity to this research. The group dynamic and the interactions between members of the group are what ultimately create value in GMB. Inherently to the fact that GMB is used for messy problems where a single solution is not present, reaching a consensus on a solution without human interaction would make the added value by GMB non-existent. In Agile and extension SCRUM, the interactions between the group are an important aspect of the method. In Agile the perceived value of interactions exists intending to have teams learn and increase competencies. In GMB this 'learning' means learning about the system and the perspective of other stakeholders.

3. Methodology

3.1. Introduction

This study aimed to unearth the possible merit of using retrospectives per the SCRUM methodology to increase understanding of group dynamics during the sessions for the facilitator and the participants, increase learning capabilities for (inexperienced) facilitators, and increase the involvement of participants during the sessions. In this chapter, the research will elaborate on the Researcher: 's perspective, the research design, ethical considerations and research limitations.

3.2. Research Philosophy

For this research, a critical realism philosophy was adopted. Critical realism (CR) dictates that knowledge is obtained from interpreting meaning from observations to explain the interactions between structural entities and contextual conditions (Wynn and Williams, 2012). CR aims to study not the event, but rather the explanation of the event. CR assumes three layers, namely the *real*, the *actual*, and the *empirical* domain. The *real* domain is the environment in which the event takes place. Included in the *real* are the social interactions, the contextual situation, beliefs and practices. The *actual* domain is where the events take place and the *empirical* domain is where the events may or may not be observed in the form of experiences. Crucially, CR does not only investigate the social interactions among participants within a phenomenon, the contextual conditions are included as well, however, they are not deterministic for the phenomena (Archer, 1995). This philosophy is often characterized by an intensive study. A limited number of cases is observed (Bygstad & Munkvold, 2011). This study aims to explore the benefits of using SCRUM retrospectives in GMB to improve group dynamics. GMB itself is not simply an event consisting of only social interaction. GMB is characterized by the interplay of the contextual setting and beliefs, the interactions and the practices. CR was adopted to understand all these aspects to provide an explanation of the event's causation based on clear, concise and empirically supported statements (Wynn and Williams, 2012).

3.3. Research approach

To answer the research question, a qualitative research approach was chosen. The reasoning behind this approach is the need to increase understanding of the multiple aspects of the explored phenomenon, such as contextual factors and social interactions (Myers, 2014). A qualitative approach provides a full appreciation of the interconnected aspects that explain the event. Qualitative research, therefore, allows for more of an in-depth exploration compared to quantitative research. The nature of the study is inductive and explorative, as the presented idea of the use of retrospectives in GMB is novel. This study plays a preliminary role in the creation of a methodological addition to GMB. Furthermore, the philosophy of CR fits well with the qualitative research approach, in that they both aim to provide in-depth and extensive insight, for which large amounts of cases are unrealistic.

3.4. Data collection

3.4.1. Sample description

Two GMB sessions were performed, one of around three hours and about four hours. The sessions were held with different groups. Both groups were of different sizes (5 and 7 participants). One of the GMBs performed two retrospectives during the GMB, the other did not. This was to provide the possibility for comparison. One GMB was held at an SME. This company will continue to be named SupplyChainCo. to ensure the anonymity of the participants and secrecy regarding information about the company's internal affairs. The second GMB was held with a collection of participants that were all stakeholders in the subject matter, further referred to as 'the student-career GMB'. The subject matter was 'the passage of students from university to work life'.

Participant	GMB	Function
1	<u>SupplyChainCo.</u>	Consultant
2	<u>SupplyChainCo.</u>	Consultant
3	<u>SupplyChainCo.</u>	Consultant
4	<u>SupplyChainCo.</u>	Management
5	<u>SupplyChainCo.</u>	Intern
1	Student-Career	Entrepreneur
2	Student-Career	Entrepreneur
3	Student-Career	Recently finished a dentalcare master's degree
4	Student-Career	Recently finished a business master's degree, board member of an organization for increasing student experience
5	Student-Career	First line manager in a prominent hotel in Amsterdam
6	Student-Career	Bachelor student management
7	Student-Career	Recently finished a technical master's degree

Table 3-1 Sample description

3.4.2. Collection methods

The data was collected through semi-structured interviews, as well as observations. In the second GMB, one of the students was not interviewed for this research, due to lack of availability. Nine of the eleven interviews took place online using Microsoft Teams, and the other two were performed in person. The interviews were all held in Dutch, as that is the primary language used by the participants. The interviews followed an interview guide (Appendix A) which was supplemented by the Researcher: asking more questions based on the participants' answers, to leave room for participants to share their experiences,

beliefs, and perceptions. All interviewed participants were informed of the anonymization and asked for consent for the use of their data.

The observations took place during the GMB sessions. The Researcher: was present during the GMB sessions and declared his interest in the process of the GMB, but did not indicate what exactly was aimed to be studied. The Researcher: otherwise did not interfere with the GMB session. This approach was chosen to provide sufficient transparency (to not make the participants weary of the observers' presence) without extensively increasing observer bias among the participants (Babbie, 2020).

3.4.3. Reliability

The GMBs followed the same structure. Both followed a specific order of scripts. Scripts, simply put, are descriptions of each sub-process in a GMB process (Andersen & Richardson, 1997). The script contains, for instance, instructions on how to perform the script as a facilitator, preparations a facilitator needs to make, the necessities needed to properly perform the GMB, the aim of the script with regards to the GMB, and the expected time necessary. A fully scripted GMB process could be repeated to scientifically test the findings of the model, as proposed by Andersen, Richardson & Vennix (1997). A benefit is the increased replicability (Hovmand et al., 2012). When describing a GMB session, it increases the ease of reporting about the methodology of the session. A facilitator may describe the process in part in the scripts that were used (Hovmand et al., 2012). The facilitators were made aware of this before the sessions. The facilitators were issued to do the GMB sessions in the following order: Graphs over time, Nominal Group Technique, Concept Model, followed by the 'initiating and elaborating a "CLD" (Scriptapedia.org).

3.4.4. Validity

To increase validity, the study aimed to decrease the contextual variability between the GMB sessions and use triangulation for the data. The latter is discussed in the data collection. Regarding the former, the decrease in variability between compared entities in a study increases the validity (Anscombe, 1948). In other words, by decreasing factors that may cause variance in the GMB sessions, the study can state with more certainty that the study measured what it intended to measure. The retrospective was planned after the

first two scripts, as the GMB would then be divided into hours. The second retrospective was planned after a fixed period due to the less structured nature of the Causal Loop Diagram building process. The first retrospective was performed after the Nominal Group Technique. The second retrospective was held an hour into building the CLD. Due to time constraints, the finalization and evaluation (model review) of the model at SupplyChainCo. was not possible. For this reason, the choice was made to do the second GMB similarly and also exclude the evaluation, to preserve validity.

3.5. Data analysis

The data analysis was performed in the following manner. All interviews were fully transcribed. Then a thematic analysis was done to determine themes in the data. This involved using the textual data of both sources – interviews and observations – to generate codes, concepts and themes. Then a coding scheme was created in Atlas.ti similar to how it is mentioned in Gioia et al. (2013). Crucially, the data from both GMB sessions was kept separate during the analysis. Both sessions have their observations, codes and coding scheme.

The first step in the thematic analysis is open coding (Gioia et al. 2013). Descriptive open codes were created based on quotes from the transcripts. This process consisted of the Researcher: reading the transcripts multiple times to look for the patterns in the answers. The answers were then assigned codes based on the relevant information the answers convey. Examples of open codes describing behaviour, feelings, and observations made by the participants, were: ‘disagreeing’, ‘recognition’ and ‘equal opportunity to speak’. These codes were grouped on similarities or 1st order concepts. Examples of 1st order concepts are: ‘Helping behaviour’ or ‘consciousness of own behaviour’.

The second stage of the coding process consists of grouping codes (Goia et al., 2013). Here first-order concepts created during the open-coding process are combined into 2nd order themes. For determining these themes the Researcher: went over the transcripts and realised that there were two major types of codes, behaviour and perception codes. Therefore, the following questions were created: 'Does this code describe behaviour or perception?'. If answered 'behaviour', the next question would be: 'What does the behaviour aim to accomplish and for whom?'. For perceptions, the Researcher: posed the question: 'What aspect of group dynamics does this code describe?'. By analysing the

codes using these questions, the Researcher: created axial codes such as: 'behaviour aimed at self', 'Openness', 'Overall experience', and 'behaviour aimed at exerting influence'.

In the third stage, the themes were, if possible, grouped on aggregate dimensions. The dimensions determined at this stage were 'participant behaviour', 'participant perception' and 'facilitator aspects'. The 1st order concepts, 2nd order themes, and aggregate dimensions could then be combined into a coding scheme, as can be seen in Appendix B

After the dimensions of both sessions were established, the most prevalent themes in both GMB sessions were supplied with evidence in the form of quotes and observations relating to the theme. Henceforth, a comparison was made between the sessions while considering the effects of the retrospective similarly based on the data in this study. This comparison is presented in Chapter 4, the results.

3.6. Ethical considerations

With regards to ethics, the study already elaborated on the ensured anonymity of the participants. This was partially for the secrecy agreement made with SupplyChainCo. A lack of anonymity would pose the possibility to determine the company in question. Furthermore, anonymity would also provide the participants with the safety to provide answers truthfully, without the fear of saying anything that may not be perceived well by their organization. For instance, a participant may not be truthful regarding the behaviour of one of their superiors should they be named in the research.

4. Results

In this chapter, the results of the thematic analysis of this study will be discussed. The chapter will be divided into three main sections, namely the first GMB session's prominent themes, the second GMB session's prominent themes and the comparison of the sessions' group dynamic. In the comparison, the difference in group dynamic are discussed based on the difference in themes that were extracted from both sessions and possible links to the retrospective are made via data obtained that mentions the retrospective. The chapter will discuss the most prominent themes from the research concerning the research question for each GMB and provide quotes from the interviews and the observations to support these results.

4.1. The GMB at SupplyChainCo.

4.1.1. Openness

One of the recognized patterns in the data for the first session at SupplyChainCo. was the prominent mention of perceived openness. Openness was derived from 'openness enhancing' and 'openness impediments' (Figure 4-1). Openness as a theme refers to the perceived freedom to speak their minds and feel comfortable and safe. Most notably when the participants were asked for their opinion on the overall group dynamic, the prevalent response was that they perceived the session as 'open' with a 'good atmosphere' where 'everyone was involved'. One participant mentioned the following when answering a question regarding his view on the overall group dynamic:

"I really had the sense that it was really good. Before the session I could still imagine that it was a somewhat more challenging topic. The one we discussed. And that possibly not everyone would be as keen on speaking their mind. However, I had the sense that people did speak their mind. Sure, you never know for certain, but I got the feeling that all participants were open and not afraid to discuss the topic at all." – Appendix B.1

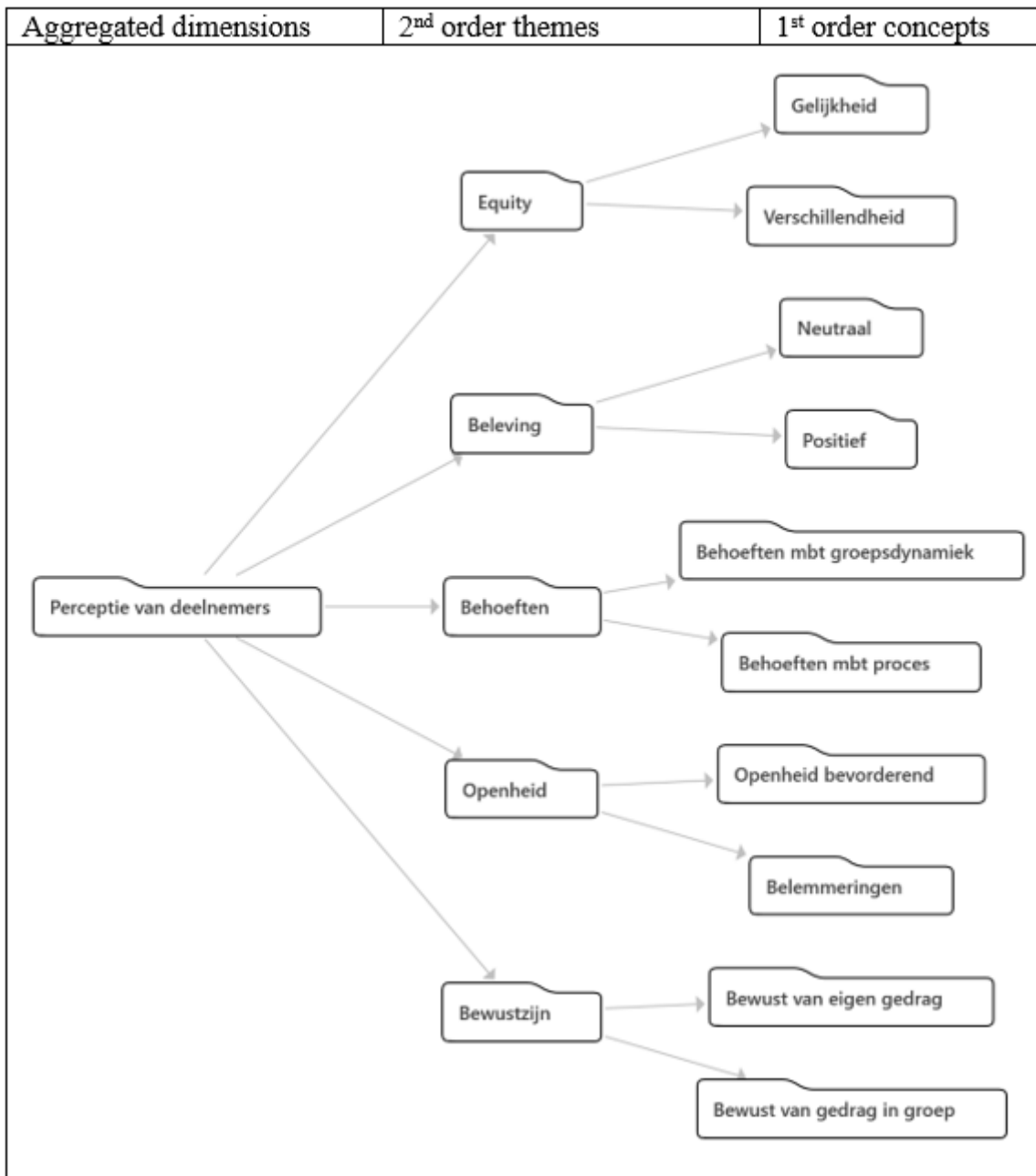


Figure 4-1 Coding scheme SupplyChainCo. for perception

All of the participants had similar experiences of openness and feeling comfortable speaking their minds. Furthermore, the quote also mentions the on beforehand expectations regarding the openness of the participant, which was due to the subject matter of the GMB. The subject matter would encompass aspects of the relationship between company and employee, a subject perceived by the participant as ‘an unliked topic’. This proved to not impede the openness. Other participants mentioned that beforehand they were expecting a slight lack of openness due to their, and the groups’, uncertainty regarding the GMB process itself. During the start, they shared that they were

'uncertain of what was to come'. This is mentioned in the following quote: *“I was still figuring out what was expected from us, but I also mentioned that during the retrospective.”* – Appendix B.3

Something that was mentioned by the participants that improved openness, is their familiarity with each other. As colleagues, some have worked together before the GMB and all are familiar with each other. This was discussed in the interviews as well. For example, participant 5 mentions the ‘open culture’ in the company and that he felt comfortable with a participant being more ‘loud’ and ‘intense’. This comfort was due to the familiarity with the other participant, something Participant 5 “would have experienced differently”, if Participant 5 had not been familiar with the participant (Appendix B.5).

4.1.2. Equity

Equity is the perception of (in)equality, equal opportunity, and feeling valued and heard. Equity is derived from ‘equality’ and ‘differences’ (Figure 4-1). For instance, ‘recognition’, ‘feeling part of the group’, and ‘equal additions’. This includes ‘perceived level of expertise’, and ‘lower rank’ or ‘higher rank’. However, the three latter were negligible according to the participants. One mention of the lack of hierarchy can be observed in the interview with a participant who was a student doing an internship. No other participant was an intern or of a similar hierarchical level. The participant was asked to describe the relationship with the other participants.

“I saw the other participants mostly as colleagues and in that sense I felt like I was on the same level (of hierarchy). One other participant was formally higher up in the hierarchy.”
– Appendix B.

Furthermore, participants mentioned hierarchy only in their awareness that another member may be subject to it, without them knowing. For instance, by acknowledging the fact that there were formal hierarchy differences: *“And similarly when I spoke with one of the other participants, I had the feeling that he was free to tell me something. Obviously, that is merely my point of view, so I am curious how participant has experienced that.”* - Appendix B.3

Overall the participants believed that all participants ‘felt part of the group’ in the GMB process, stating for example that ‘other participants partook in active discussions with them’ and ‘people asked me questions’. Further evidence is pointing towards a perceived sense of equity, despite the differences in the hierarchy. Such as the statement:

“Recognition was given by the group to the fact that I was sitting at the back, despite it not really seeming like an issue for me” – Appendix B.5

Overall the pattern of equity is present in all interviews, however, the observations show some disparity in additions by participants as well. *“A discussion starts regarding something mentioned by a participant. The discussion mainly is performed by the three participants sitting in the front of the room”*. – Appendix B.1

Although it is important to mention this observation to project all aspects of the session, the overall session included all participants in most discussions.

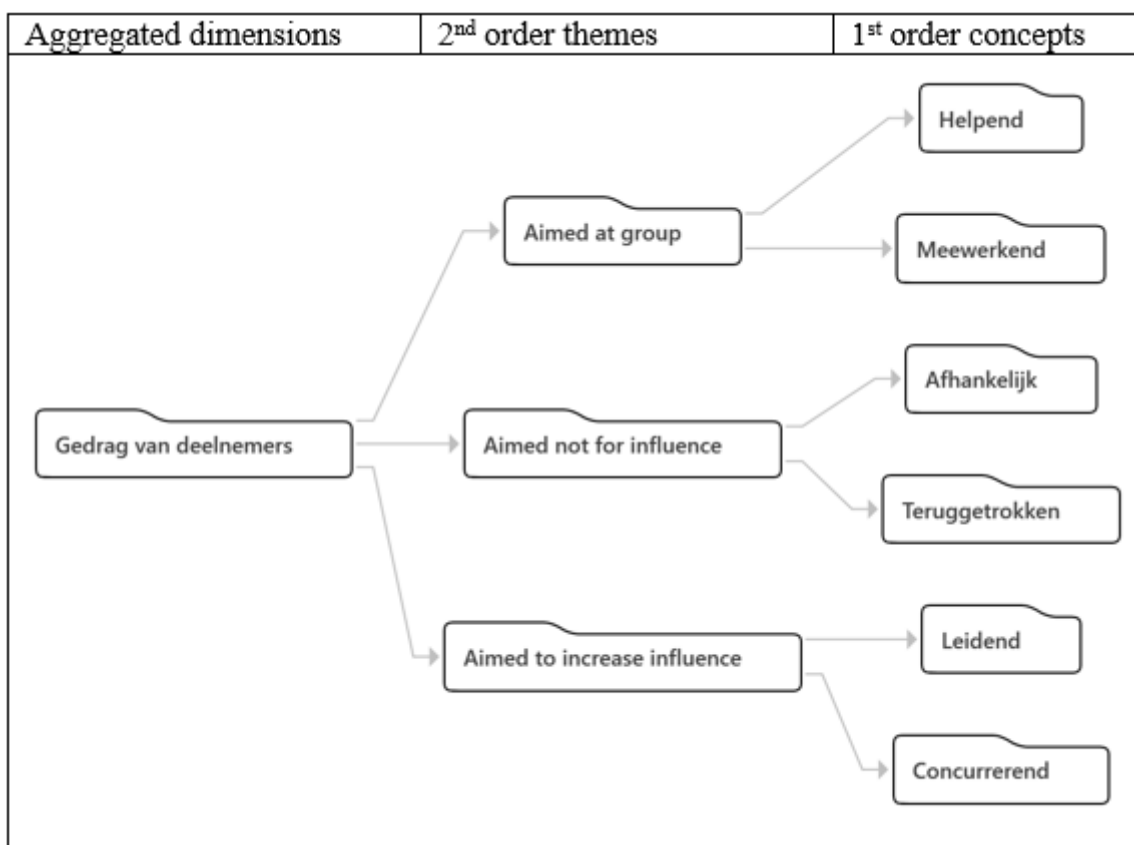


Figure 4-2 Coding scheme SupplyChainCo. behaviour

4.1.3. Behaviour aimed at the group

'Behaviour aimed at the group' can best be explained as behaviour that has the goal to benefit the group. This theme is deduced from 'cooperating' and 'helping' (Figure 4-2). This is for instance: 'leaving room for others to speak', 'asking for other views', and 'being actively involved'. Mainly the concept of cooperating was present in this theme. Behaviour that was mentioned by the participants was for instance 'waiting to speak' or 'allowing room'. The latter is for instance mentioned by Participant 4 in the following citation: *"I think it is crucial that you don't overrun other participants with your enthusiasm. And also that you let the others know that you make others aware that they are allowed to speak up when they do not get enough room to speak."* – Appendix B.4. Furthermore, some respondents claimed they were extra aware of their behaviour. four participants mention that they focused on their behaviour during the session to avoid 'interrupting' or 'answering a question posed to another participant'.

A participant declared that they were a "super interested" and "actively involved group". She related these perceptions to the behaviour of "talking a lot", "consulting others" and "sharing their opinions", which she 'perceivably amused' attributed to the participants "being consultants after all" (Appendix B.4)

The 'behaviour aimed at the group' exhibited a higher degree of prominence within the session in comparison to alternative behavioural concepts, such as 'behaviour to increase influence' or 'behaviour to avoid influence'.

4.2. The GMB on student-careers

4.2.1. Openness

In the second GMB there was a prevalence of two concepts of the openness theme, 'openness enhancements' and 'openness impediments' (Figure 4-3). Perceptions of openness were enhanced by 'valuing diversity', 'recognition of different personalities', and 'creating consensus'. The latter refers to 'the need for consensus before moving on', hence including all participants. According to the participants, this was mainly due to the facilitator. The facilitator *'made sure everyone had their chance to agree or not and to elaborate'* and *'asked the right questions to achieve consensus'* - (Appendix B.8) Furthermore, the 'valuing of diversity' was a recurring concept in the data. Examples were the mentioning of the benefit of having different ages, by all participants. Other examples

of the participants mentioning an appreciation for the diversity were a ‘fascination of the different backgrounds’ and the ‘new insights and ideas’ that the participant was having because of the diversity (Appendix B.7). The participant in the hotel industry mentioned this diversity in an answer regarding his feeling of being an addition to the group: *“And I also think that because I was, as far as I know, the only one with a hospitality background, that’s why I had a kind of different perspective or could provide a different angle, compared to, for example, the technical student. During the pandemic, the chip industry was making a lot of money, and that was given as a general economic argument. And then I thought, well, what about my industry?”* – Appendix B.10.

Another concept benefitting the openness according to the participants was their recognition of the different personalities. A participant mentioned the following: *“Yes, I think that actually always applies to some extent. You always have people who are just a bit more in the foreground and who perhaps speak before they have thought about it. And people who are more absorbed in their own thoughts.”* – Appendix B.8.

The lack of recognition of personalities was described by a participant as potentially harmful to the model. The participant explained that he thinks ‘in hindsight the model is of higher quality with equal input from all participants’ and ‘making sure everyone feels safe, increases the feeling of openness’ (Appendix B.6). The role of the facilitator in ‘making sure all participants are reminded of this’ is highlighted by the participant. The role of the facilitator concerning openness was mentioned in three other interviews as well.

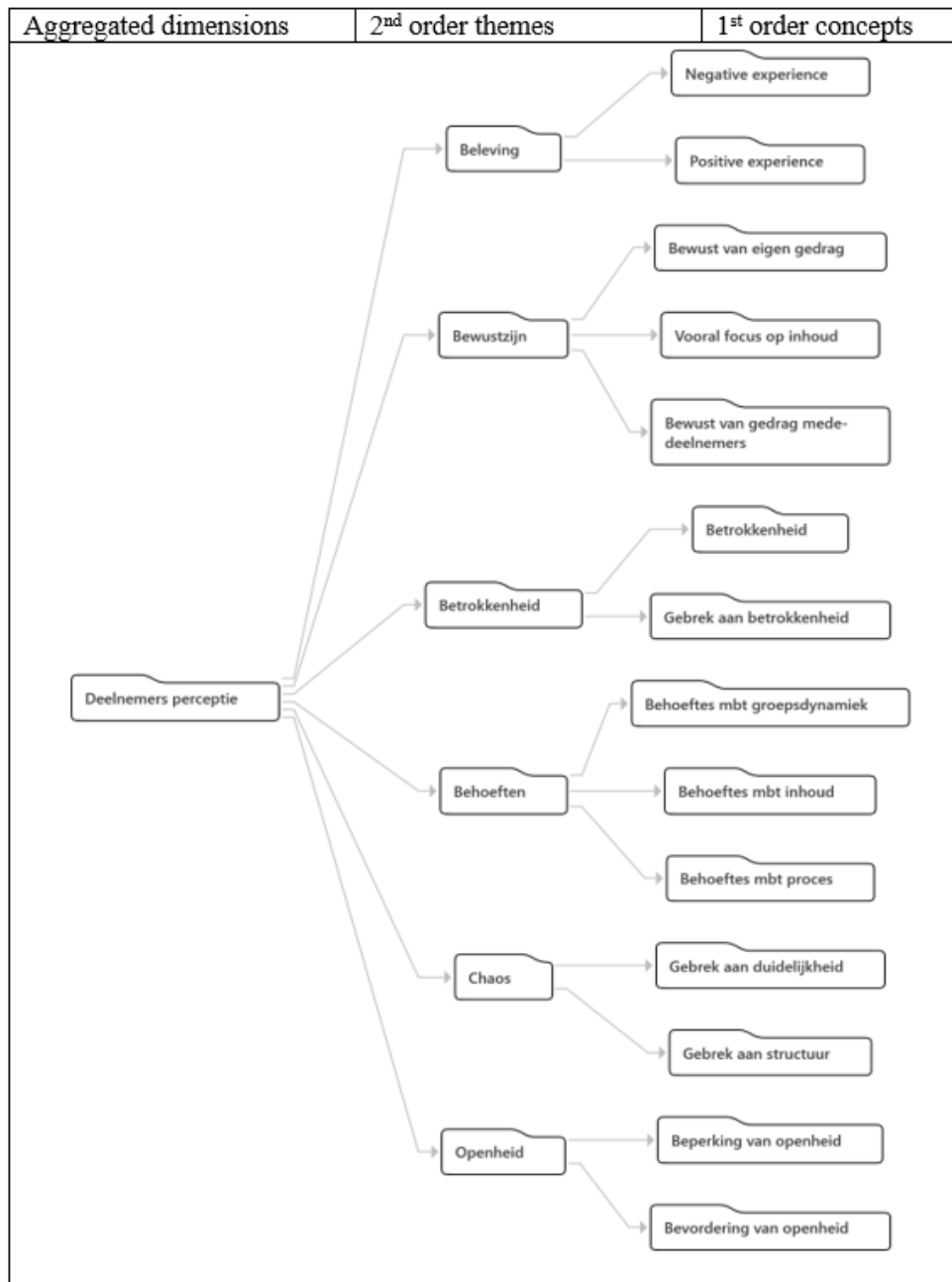


Figure 4-3 Coding scheme Student-Career GMB perception

Different perceptions of impediments to openness were shared by all participants. Multiple impediments have been observed by the participants, as well as by the Researcher: . Impediments such as ‘impediments due to dominant personalities’, ‘unfamiliarity with participants’ and ‘being overridden’ were prevalent. Participant 4 (Appendix B.9) shared the perceived difficulty of adding her views to a discussion due to the dominant behaviour of other participants. The participant elaborated further, stating

that she had at one point "collaborated with another participant to share their thoughts as a unit" to not be overrun.

"I do think that the increased feeling of comfort was less beneficial for me. I believe that as a result, despite the increased feeling of openness, because other individuals also felt more at ease, it led to me being overruled more frequently. As I mentioned earlier, this meant that we sometimes would attempt to assert our opinion simultaneously with another participant. I noticed that the discussions also became more intense, so when I expressed something, it was met with stronger reactions, and I didn't always find that pleasant." –

Appendix B.9.

The participant mentions this was during the second half of the session during the construction of the CLD, where there *"was a less inherent structure in the activity"* –

Appendix B.9

4.2.2. Chaos

Over the course of the study, during the interviews and the observations, a pattern emerged which is now referred to as chaos. Chaos is one of the main themes in the second GMB. Concepts relating to Chaos are 'lack of structure' and 'lack of clarity' (Figure 4-3). The lack of structure, partially influenced by the facilitator, was referred to in the observations as well as the interviews. From the observations, for instance, the study can perceive a lack of structure in the form of 'discussions between some participants but not all', 'participants no longer listening', and 'speaking before your turn'. i.e. in the observations, there is the mention of *"When clusters are formed, participants call out simultaneously that they have variables and want to be the first ones to take their turn."* –

Appendix B.2

This lack of structure is continued into the session when the participants 'lose sight of the aim of the task'.

These codes are present in the interview data as well. Participants mention a 'lack of structured discussions', 'increased interruptions' and 'lack of room for input by other participants'. This lack of structure was unappreciated by the participants. Participant 1 mentions: *"When I get the feeling that I don't have the structure, that I don't understand it, that I don't know where it's going, or if it's going anywhere at all, then we should change something, then I will find it bothersome. And if I can't follow, so to speak, because that's*

really what it comes down to, then I find it frustrating that I can't contribute." – Appendix B.6.

Other participants shared other reasons for preferring the structure, such as 'lack of engagement' and 'lack of room to contribute'.

Lack of clarity became apparent in the data as a concept as well. The participants' answers differed in their perspectives. Most answered that there was a lack of clarity for them, and two mentioned that there were moments with a lack of clarity for others. When asked if there were any impediments in the session according to the participant, the response was: *"Yes, there were. They happened mostly when a task was not clear. When there was a lack of understanding of what exactly we were supposed to do."* - Appendix B.11

A participant (Appendix B.6) also mentioned that he at some point *"could not follow"* due to the intellectual requirements of the task, as well as the subject.

In general, the participants perceived the session to have more chaotic interactions.

Participants felt they were unintentionally excluded due to 'not being able to get the attention of the group', or 'being overrun'.

4.2.3. Behaviour aimed at influencing the group

From the concepts of 'leading' and 'competitive' behaviour, the theme 'behaviour aimed at influencing the group' was deduced (Figure 4-4). This behaviour has the characteristic to change another person's view or behaviour. For example, in the GMB session with regards to 'leading' there is behaviour such as 'involving participants in the session', and 'calling out others' behaviour'. These behaviours are grouped with 'competitiveness' which is similar in its aim but different in the reasoning why influencing is necessary. Competitiveness is aimed more at enabling your additions, rather than the groups'. This becomes apparent in the underlying quotes. For instance, in the observations, there is a mention of 'the participants asking the more silent participants to be more involved'. Other examples are 'interrupting', 'suppression of other views' and 'mirroring the dominant behaviour of others'. In contrast, 'leading' shows behaviour more aimed at the benefit of the group dynamic. For example the following quote: *"And actually, I was occasionally, so to speak, put in my place. Like, "Okay, now we're dealing with this person or that perspective, and then you will get your turn." This gave me a chance to express the things I shouted out. And in this way, I had a little more time to think, so that someone who might*

be easily intimidated, by someone who, like me, quickly blurts things out, still had a very good opportunity to clearly express their opinion, with the space to explain everything. Without me sort of barging in.” – Appendix B.10

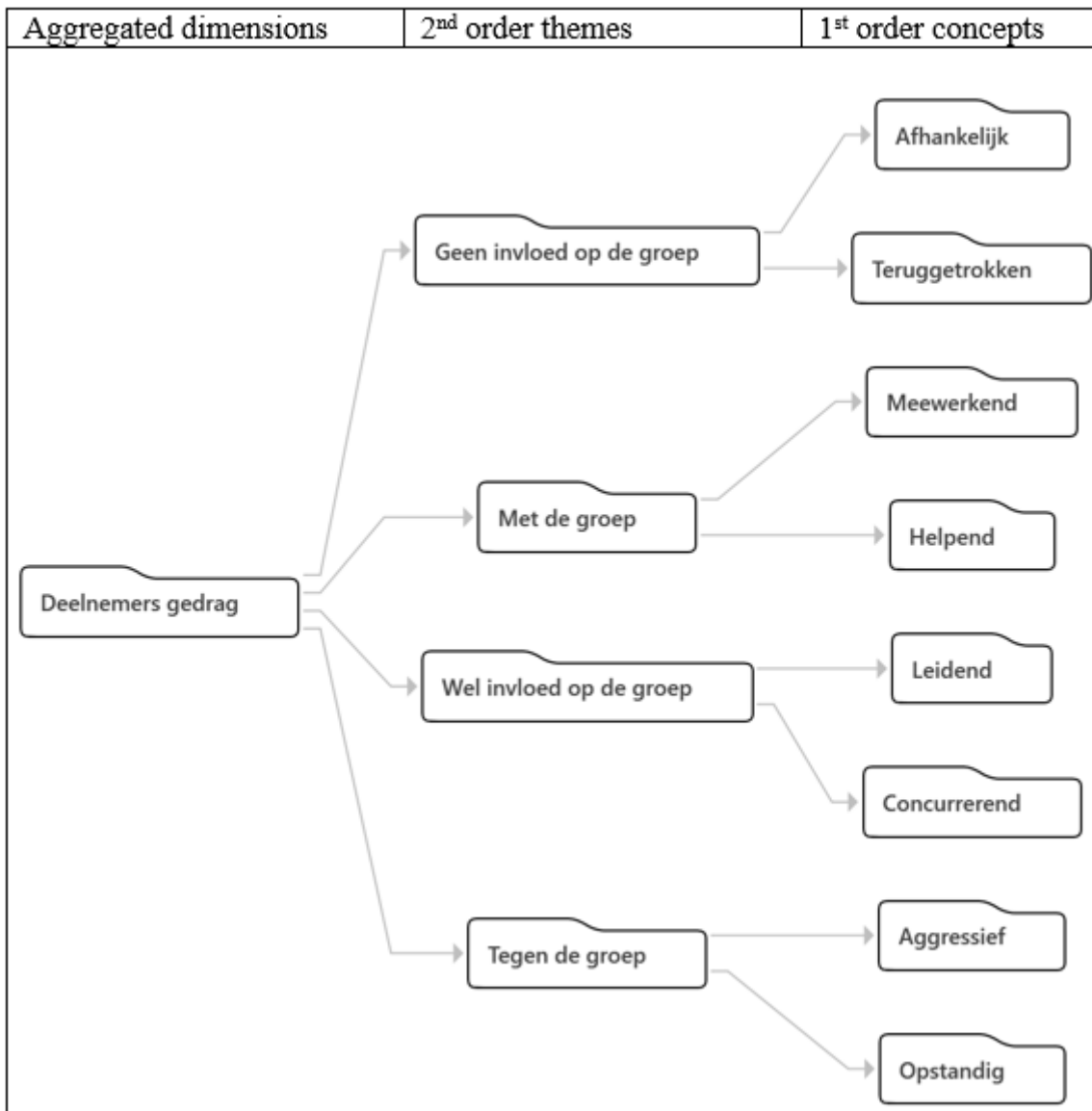


Figure 4-4 Coding scheme Student-Career GMB behaviour

4.2.4. Behaviour not aimed at influencing the group

The opposite of behaviour aimed at influencing is behaviour not aimed at influencing. Concepts in this theme were ‘retracting’ and ‘dependent’ (Figure 4-4). Dependent behaviour is characterized by ‘conformism’ and ‘feeling uncertain’. The participants generally classified the behaviour negatively through ‘conflict avoiding’, or ‘decreasing the quality of the model’. Furthermore, their view radiated a sense of it being

‘unavoidable’ or ‘fine’ due to the perceived inability to change the behaviour of the other participants. A participant also connected the dependent behaviour to the feeling of a ‘lack of knowledge’. In other words, the dominant participants were seen as ‘more knowledgeable’.

Retracting behaviour is different from dependent behaviour in the sense that it stems from a more self-benefitting approach than dependent behaviour. Retracting according to the participants was the inevitable effect of ‘frustration’ and ‘lack of interest’. In two of the participants’ answers, we can read the following:

“If you're then interrupted by someone, you simply feel a bit irritated and you also disengage more quickly. As a group, I also noticed that we didn't always have a clear overview, or sometimes we focused excessively on a detail.” – Appendix B.9

“At a certain point, when there are prolonged discussions about a particular viewpoint that isn't mine, I've eventually said, "You know what, I won't get involved anymore," and then I just let it be.” – Appendix B.7

These examples show frustration as well as an induced lack of interest or engagement. More participants, mostly the ones that showed less dominant behaviour themselves, shared these negative experiences.

4.3. Comparison of prevalent themes

To ascertain whether the retrospective conducted held value, within this third part of the results, the differences in group dynamics are presented.

‘Openness’ was a prevalent theme in either GMB. In the GMB session on student-careers, there were themes observed which were not present in the SupplyChainCo. GMB, such as: ‘Chaos’, ‘behaviour aimed at influence’ and ‘behaviour not aimed at influence’. In the SupplyChainCo. GMB, themes such as ‘equity’ and ‘behaviour aimed at the group’ were present which were not in the student-career GMB.

Openness, which, for the second GMB, showed a higher presence of openness impediments in relation to openness enhancements compared to the first GMB where the openness theme was skewed towards openness enhancements. Furthermore, the openness enhancements concept itself in the GMB on student-careers differed from the openness enhancements in the GMB at SupplyChainCo. For instance, in the student-career GMB the openness stemmed from the ‘appreciation for diversity’, the ‘recognition of different

perspectives', and the influence of the facilitator providing 'involving all participants in the consensus' as well as 'being impartial'. The facilitator's efforts are mentioned in the data on multiple occasions concerning openness. One of which is the following: *"What I found really beautiful was that no matter what someone said, every response was fully respected. I think everyone, including myself, got the impression that whatever you said, it was a meaningful contribution. It was considered valid. There were no wrong answers. What you said was also shared by the facilitator with the group to check. "is it clear what's being said here?" or "Does anyone need further clarification?" "Yes?" "No?" I thought it was quite nice."* – Appendix B.7.

The openness in the SupplyChainCo. GMB was largely attributed to 'familiarity'. However, in addition to the previous quotes which show openness, there are other mentions of openness which relate to the retrospective. The retrospective was perceived as a 'valuable addition', and a quote from one participant stated the following: *"You also provide insights for the facilitator, so to speak, into areas where they may need to pay more attention. Moreover, you offer others insights into your perspective, thereby allowing others to rectify misunderstandings, for instance."* – Appendix B.4

In the GMB on the student-career subject matter, there were perceptions of 'lack of structure' and 'lack of clarity' which attributed to the session being 'chaotic'. Furthermore, there was more retracting behaviour, which stemmed from the 'dominance of some participants' and the 'intense discussions causing discomfort'. A participant stated that they would have appreciated being able to somehow 'step out of the session for a second to address these issues'. Moreover, three participants, participants 2, 3 and 4, proposed a moment of reflection in a future GMB session. Stating that "discussing feelings", "discussing roles in the group" and "discussing the process" would have potentially increased "awareness" and "improved the group dynamic".

In the SupplyChainCo. GMB there was some increase in clarity for the participants through the retrospective as they were able to ask questions and provide the facilitator feedback regarding the process. In the observations, it shows that participants were "uncertain of what exactly the process would look like". Furthermore, one participant who joined the GMB last minute stated that she "was insecure" due to the 'lack of preparation'.

However, in the retrospective, she realised that the other participants were equally uncertain, which decreased her hesitance. *"Well, it also became clear that others didn't exactly know what was coming, so the fact that I hadn't had much preparation time wasn't necessarily a problem. That became evident with that."* – Appendix B.1 Observing the disparity of the themes with the data in mind relating to the retrospective provides some differences in the progression of the sessions. The GMB where the retrospectives were performed provided little perception of a behaviour change. However, the participants stated multiple times that their awareness of their behaviour increased. The retrospective "increased made them reflect on their behaviour", which caused them to 'consider the effects of their behaviour on others more.'

Moreover, the retrospectives were deemed an addition in terms of improving the certainty of the group's perception of equity. Meaning, participants stated that they were more certain of their perception of equity in the session. For example, one participant when asked about whether all participants had the same amount of input, answered: *"You've discussed it, whether it is indeed the case that everyone has enough time to contribute. It may not necessarily have been worse without the retrospective. But the probability of it being more equally shared increases, as you have done a sort of analysis of it."* – Appendix B.4.

Although the effect was minimal on behaviour according to the participants, they perceived some behaviour change. A participant perceived a "decrease in interruptions" from the other participants and regarding herself stated: *"Yes, I did notice that I myself thought, okay, I should at least let that person finish completely so that you might even think, oh, do you mean this or this. So I was indeed more consciously focused on not filling in for someone else what they meant."* – Appendix B.2.

Lastly, the facilitator improvements were discussed in the data concerning the retrospective as well. Participants showed appreciation for the 'provided clarity' as well as the 'perceived increased insight for the facilitator regarding what the facilitator can focus more on'. It should be noted that the facilitator "shared his appreciation for the reflection at the end of the session", as stated in the observations. One quote showed the increase in clarity due to the retrospective clearly, stating: *"The facilitator provided further*

clarification about the process, explaining where exactly we were headed and what the subsequent steps would look like.” – Appendix B.2

5. Conclusion and discussion

The study will aim to explore to what extent SCRUM retrospectives can improve the GMB methodology in the form of a better understanding of the group dynamic from the facilitator and in the form of the participants having a better experience overall, as well as whether the methodology is feasible to be incorporated in the GMB method in such a way that it provides beneficial additions to the GMB methodology without interrupting the core principles of GMB. The research question of this study was:

To what extent is there merit to using ‘SCRUM retrospectives’ in Group Model-Building to improve the understanding of the group dynamic?

To answer the research question, some merits of using SCRUM retrospectives in Group Model-Building which were observed in this study will be discussed. Furthermore, the implications, limitations, future research and ultimately the conclusion will be presented.

5.1. Interpretation of the results

The results of the study there present multiple indications of the merits of using SCRUM retrospectives. Potential benefits as stated in Chapter 1.1.2 are presented as follows:

1. More awareness of the facilitator with regard to the group dynamic.
2. Provide structure without sacrificing its dynamic and fluid nature.
3. A better experience for the participants overall due to an increased sense of freedom of speech and increased engagement.

In the following section, these benefits will be discussed. Furthermore, perceived additions which were not part of the expectations will also be discussed.

5.1.1. The first benefit

The increased awareness of the facilitator is shown in the results in the last section of the results in Chapter 4. Participants stated that they perceived increased awareness from the facilitator regarding their needs, as well as more clarity. The facilitator stated that he believed the retrospective to be an addition to the methodology. Furthermore, in the

student-career GMB, participants indicated that they perceived a disconnect with the facilitator on some occasions. All in all, these results indicate merit to using SCRUM retrospectives in the GMB methodology.

5.1.2. The second benefit

The second potential benefit equates to a 'better experience for the participants overall due to increased sense of freedom of speech and increased engagement'. As stated by Rouwette & Smeets (2016), an open playing field is essential. Factors that increase the challenge of having an 'open playing field', as mentioned previously in this study, are, for example, power differences, insecurity due to lack of understanding and/or personality differences. According to the results of this study, participants experienced a higher level of openness and more awareness of equity. These factors were captured in the themes of openness and equity. The comparison of the themes shows a disparity. In the SupplyChainCo. session, there was a higher relative presence of openness enhancements. This indicates a higher level of openness, compared to the student-career GMB, where the impediments were as prevalent as the enhancements. Furthermore, participants indicated increased an level of clarity on multiple occasions due to the retrospective. This was in contrast to the presence of the chaos theme in the student-career GMB. In the student-career GMB, some participants also indicate their preference for a reflection to discuss feelings and behaviour.

The results indicate merit to using SCRUM retrospectives in GMB concerning the third potential benefit.

5.2. Limitations and future research

The potential benefit, the increase in structure, was not present in the data of this research. Therefore, it is not possible to provide any indication as to what extent there is merit to use SCRUM retrospectives to provide structure in the GMB session.

Second, is the limited amount of cases. As a study into the combination of SCRUM retrospectives and GMB methodology, the study provides not enough data to (1) provide scientific insight on all initial potential benefits, and (2) diminish doubts regarding the validity of the research. To improve the research on the subject matter, more GMB

sessions should incorporate a SCRUM retrospective. By providing more data, more insights can be generated which help our understanding of the potential benefits and potential disadvantages that SCRUM retrospectives deliver. Furthermore, future studies can improve our understanding of the use of scripts as a planning tool. This can be achieved by allowing for more flexibility for the facilitator with regard to choosing the content and order of the GMB practices. This is to perform GMBs in a more structured, but less set-in-stone manner, where they can choose before each sprint which script they will perform based on what is necessary for the specific GMB.

Third, the methodology by which this study was performed presented some limitations. One possible improvement in the methodology is to hold the interviews face-to-face. By holding interviews face-to-face, a Researcher: has the option to observe a participant during the interview. The body language of the participant could enhance the data and increase the understanding of the participants' experience.

Fourth, a further limitation of the study is the inherent unknown difference in the groups before the study. The GMB that was held at SupplyChainCo. consisted of employees, some of whom were colleagues. Although the participants in the second GMB were somewhat familiar with each other, there are differences to be expected in the familiarity among participants.

As a last limitation of this research, it is worth noting that a bias may be present in the codification of the data. Deduction of the themes for both sessions, although constructed entirely separately, were done by a single Researcher: . Considering this research has a qualitative approach and a Critical Realism philosophy, some subjectivity is expected. Although, it is worth noting, extra attention was given to the analysis. Furthermore, for the same reason, the codes used in the analysis of session one may overlap partially with those of session two, due to a single Researcher: analysing both data sets. This is not necessarily a limitation, but something worth considering. Avoiding the issue altogether may present a challenge in itself as the codes would then be less accurate. As such, care was given to the comparison in the results and the following conclusion(s).

5.3. Conclusion

The research question that this study aimed to answer was whether there is merit to the use of SCRUM retrospectives in GMB. In conclusion, this study has shown that there is merit to the use of SCRUM retrospectives. Reasons to use SCRUM retrospectives include the decrease of the challenges of keeping an open playing field in GMB sessions. This study shows that a retrospective achieves more engagement, more awareness of power differences, and a decrease in uncertainty due to a lack of understanding. Furthermore, concerning the facilitator, there is merit in using SCRUM retrospectives to increase the facilitator's understanding and awareness of the group process. This increase allows for more clarity on the effect of the choices of inexperienced facilitators. Therefore, allowing inexperienced facilitators to gain experience and understanding in a more clear, and structured way.

6. Practical implications and recommendations

6.1.1. Practical implications and recommendations

This research shows that the use of SCRUM retrospectives is beneficial to the GMB method. Therefore, GMB practitioners, be they Researchers or otherwise, should consider adding retrospectives to their projects. The retrospectives enhance the feedback structures in the GMB projects, enabling the facilitators and improving the group dynamics.

Secondly, the increased data on group dynamics gained by the retrospectives should not be relinquished. Rather, it should be used to expand our knowledge of group dynamics. In- and outside of GMB.

Thirdly, it is important to note that for the use of these SCRUM retrospectives in a GMB, a facilitator should carefully consider the contextual differences. For instance, the length of the GMB, and the amount of participants. The number of participants can become a limitation for the use of retrospectives. As the amount of participants increases, the amount of time and energy necessary to have a productive retrospective increase (Derby, 2006). Ultimately, this can prove to make a retrospective not viable for GMB projects

with too large groups. Furthermore, the methodology of conducting a retrospective was carefully considered before the GMBs in this research. Considerations regarding the length of the retrospectives, as well as the amount and the moment of performing a retrospective in the session. This research recommends future studies to change these contextual factors and properties of the retrospective, to search for improvements, as much as validation.

6.1.2. Reflection on design choices

Overall the design choices, in hindsight, are satisfactory. Alternatives of the design choices made are, for instance, performing one GMB session with retrospectives, or performing two GMB sessions both including retrospectives. The benefit of the latter is the increased data specific for the retrospective effect, and the increased validity due to lower potential disparity of inherent group differences. Performing a single GMB with a retrospective would have provided a weak result with questionable validity.

6.1.3. Strengths and weaknesses

The study adds to the existing body of knowledge by innovatively integrating SCRUM retrospectives, into the Group Model Building (GMB) process. This holistic and innovative approach addresses a gap in the literature and opens up new avenues for enhancing collaborative problem-solving. The research highlights how SCRUM retrospectives contribute to increased openness in the group dynamic. The promotion of equitable participation is another noteworthy strength, ensuring that diverse perspectives are valued and integrated, thereby potentially leading to more inclusive models.

The study involved only two GMB sessions, which might limit the power of the findings. The small amount of cases could affect the robustness of the conclusions drawn.

7. References

- Abrahamsson, P., Salo, O., Ronkainen, J., & Warsta, J. (2017). Agile software development methods: Review and analysis. In *arXiv [cs.SE]*. arXiv. <http://arxiv.org/abs/1709.08439>
- bD. F., & Richardson, G. P. (1997). Scripts for group model building. *System Dynamics Review*, 13(2), 107–129.
- Andersen, D. F., Richardson, G. P., & Vennix, J. A. M. (1997). Group model building: adding more science to the craft. *System Dynamics Review*, 13(2), 187–201.
- Babbie, E. R. (2020). *The Practice of Social Research*. Cengage Learning.
- Beauchamp, M. R., & Jackson, B. (2007). Personality processes and intra-group dynamics in sport teams. *Group Dynamics in*.
- Dahl, R. A. (2007). The concept of power. *Systems Research: The Official Journal of the International Federation for Systems Research*, 2(3), 201–215.
- Derby, E., Larsen, D., & Schwaber, K. (2006). *Agile Retrospectives: Making Good Teams Great*. Pragmatic Bookshelf.
- Flick, U., von Kardoff, E., & Steinke, I. (2004). *A Companion to Qualitative Research*. SAGE.
- Franco, L. A., Rouwette, E. A. J. A., & Korzilius, H. (2016). Different paths to consensus? The impact of need for closure on model-supported group conflict management. *European Journal of Operational Research*, 249(3), 878–889.
- Hovmand, P. S. (2014). Introduction to Community-Based System Dynamics. In P. S. Hovmand (Ed.), *Community Based System Dynamics* (pp. 1–16). Springer New York.
- Hovmand, P. S., Andersen, D. F., Rouwette, E., Richardson, G. P., Rux, K., & Calhoun, A. (2012). Group model-building “scripts” as a collaborative planning tool. *Systems Research and Behavioral Science*, 29(2), 179–193.
- Hovmand, P. S., Rouwette, E., Andersen, D. F., Richardson, G. P., Calhoun, A., Rux, K., & Hower, T. (2011). *Scriptapedia: A handbook of scripts for developing structured group model building sessions 1*. repository.ubn.ru.nl.
- Huber, B. (1999). *Experts in organizations: The power of expertise*. Citeseer.
- Ionel, N. (2019). Critical analysys of the Scrum project management methodology. *Analele Universitatii Din Oradea. Fascicola Matematica*.
- Kaner, S. (2014). *Facilitator’s Guide to Participatory Decision-Making*. John Wiley & Sons.

Kumar, G., & Bhatia, P. K. (2012). Impact of agile methodology on software development process. *International Journal of Computer Technology and Electronics Engineering (IJCTEE)*, 2(4), 46–50.

Matthies, C., Dobrigkeit, F., & Ernst, A. (2019). Counteracting Agile Retrospective Problems with Retrospective Activities. In *Systems, Software and Services Process Improvement* (pp. 532–545). unknown.

McCormick, M. (2012). Waterfall vs. Agile methodology. *MPCS, N/A*, 3.

Principles behind the Agile Manifesto. (2001).
<https://agilemanifesto.org/principles.html>

Richardson, G. P., & Andersen, D. F. (1995). Teamwork in group model building. *System Dynamics Review*, 11(2), 113–137.

Rouwette, E. A. J. A., & Franco, L. A. (2015). Messy problems: Practical interventions for working through complexity, uncertainty and conflict.

Rouwette, E., & Smeets, S. (2016). 9: Conflict, consensus and the management of a good debate Exploring the deliberative assumptions of group facilitating techniques. repository.ubn.ru.nl.

Salza, P., Musmarra, P., & Ferrucci, F. (2019). Agile Methodologies in Education: A Review. In D. Parsons & K. MacCallum (Eds.), *Agile and Lean Concepts for Teaching and Learning: Bringing Methodologies from Industry to the Classroom* (pp. 25–45). Springer Singapore.

Schwaber, K. (1997). *SCRUM development process*. Springer.

Schwaber, K., & Sutherland, J. (2020). *Purpose of the Scrum Guide*. udecareer.com.

Senge, P. M., Otto Scharmer, C., Jaworski, J., & Flowers, B. S. (2005). *Presence: An Exploration of Profound Change in People, Organizations, and Society*. Crown.

Tavella, E., & Papadopoulos, T. (2015). Novice facilitators and the use of scripts for managing facilitated modelling workshops. *The Journal of the Operational Research Society*, 66(12), 1967–1988.

Van Nistelrooij, L. P. J., Rouwette, E. A. J. A., Verstijnen, I. M., & Vennix, J. A. M. (2012). Power-leveling as an effect of group model building. repository.ubn.ru.nl.

Vennix, J. A. M. (1996). Group model building. *System Dynamics*, 2, 123–132.

Vennix, J. A. M. (1999). Group model-building: tackling messy problems. *System Dynamics Review*, 15(4), 379–401.

Wilkerson, B., Aguiar, A., Gkini, C., Czermainski de Oliveira, I., Lunde Trellevik, L.-K., & Kopainsky, B. (2020). Reflections on adapting group model building scripts into online workshops. *System Dynamics Review*, 36(3), 358–372.

Yildiz Durak, H. (2022). Role of personality traits in collaborative group works at flipped classrooms. *Current Psychology* , 1–21.

(n.d.). *Scriptapedia*. Scriptapedia. Retrieved August 13, 2023, from <https://en.wikibooks.org/wiki/Scriptapedia>

8. Appendix A – interview guide

Theme	Main question	Sub-topics/direction of follow up questions (FU)*
Introduction questions	<p>-“The answers from this interview will be used in my master thesis. The participants will be anonymized. If there are any concerns regarding answers given, feel free to withdraw these answers”</p> <ul style="list-style-type: none"> - What is your name? - What is your age? - Can you briefly explain your function within the organization? - For how long have you been with this organization? - How would you describe your perceived relationship with the other participants in the GMB session prior to the GMB session? 	<p><i>Provide a safe environment for the participant to answer as freely as possible.</i></p> <p><i>Provide some basic information as well as settling into the interview slowly.</i></p> <p><i>Furthermore it provides some insight in the standings between the participants at the start of the session.</i></p>
Level of understanding of the group process by the facilitator	<ul style="list-style-type: none"> - What is your opinion of the facilitator during the session? 	<p><i>Measuring a baseline for the perceived interaction between facilitator and participants</i></p> <p>FU: how did your opinion change over the course of the session?</p>

		<i>Aimed at measuring change due to retrospective or lack thereof</i>
Perceived quality of the process and structure of the session	<ul style="list-style-type: none"> - What is your opinion of the overall group dynamic - Did you experience any form of impediments during the session? 	<p><i>Measuring a baseline for the perceived quality of the group process</i></p> <p>FU: how did the group dynamic evolve over the course of the session?</p> <p><i>Aimed at measuring perceived improvement or deterioration of the group dynamic</i></p>
Perceived overall experience of the session	<ul style="list-style-type: none"> - In which ways did you feel like a significant addition to the group? 	<p><i>Measuring a baseline of how the participant felt about their contribution during the session</i></p> <p>FU: What influenced the feeling of significance or lack thereof for you?</p> <p><i>Reasons for feeling left out</i></p> <p>FU: How did your experience change over the course of the session?</p> <p><i>Aimed at measuring a change in experience</i></p>
Closing questions	<ul style="list-style-type: none"> - Are there any closing remarks you want to add to this interview? - Do you have any questions? - Do you consent to the use of your answers, anonymized, in this research? 	<p><i>Allow the interviewed participant to add data they deem necessary and is not mentioned so far.</i></p> <p><i>Allow room for elaboration/explanation regarding the interview or the research.</i></p>

*follow up questions can vary in interview. Examples given here are merely to provide a direction for the researcher.