



Chatbot-Supported Retrospective

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Abstract

Retrospectives are not just a part of agile projects, but also the driver that keeps the entire project, from initiation to successful completion, on track. By conducting them regularly, a project team can analyze and, if necessary, align the agile practices at the team level. In practice, however, conducting a retrospective as part of an agile project to generate qualitative benefit is a complex process that is significantly influenced by personal behaviour. Particularly for newly formed teams, the retrospective is often not fully successful at the beginning. A chatbot-supported retrospective helps novice Scrum Masters and newly formed teams to provide new stimuli for reflection during a stagnating retrospective. The chatbot, as the team's electronic coach, purposefully steers the retrospective by addressing critical issues from a neutral perspective. The chatbot is mainly placed at the situation for evaluating the current state. In addition to a set of standard questions, the Scrum Master can deposit additional questions as needed. The evaluation of the requirements and the solution concept took place within the Co-Innovation Lab (Günzel et al 2019) of the Munich University of Applied Sciences.

Key words: *Agile Project management, Retrospective, Chatbot*

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Introduction

The retrospective is a central element in agile project management, as the team repeatedly evaluates its own approach during the project and can take corrective actions in the case of deviations. The statement by Soichiro Honda "Success can only be achieved through repeated failure and introspection." (Atkinson et al 2014) expresses the basic framework of the retrospective, in that through *Inspect and Adapt* procedural errors of the team can be identified and eliminated by the team itself. Retrospectives serve as an occasion to take a look at the past - in detail at the last sprint - and to reflect on which aspects are good, but also which topics can still be improved. Thus, a basis for continuous improvement can be achieved (Kerth 2001).

According to Luckner and Nadler's (1997) comfort zone model, a distinction is made between the learning, comfort, and panic zones, which are crucial for learning and further development. Normally, team members are in the comfort zone because they feel comfortable with familiar tasks and situations. Nevertheless, learning psychology assumes that learning in the comfort zone is sparse to impossible (Michl 2020). The goal of the retrospective must be to get the team members to leave their personal comfort zone and enter the learning zone during the execution. This only works based on an appropriate framework, which on the one hand depends on the trust-inspiring environment (Sutherland 2015). On the other hand, entering the learning zone depends on the use of a framework of rules to achieve the establishment of privacy (Andresen 2017). Specifically, the way participants' contributions are handled is responsible for the success of the retrospective. Interest and attention must be given to team members' contributions, as well as an appreciation for their participation back. This ensures and encourages long-term engagement of the individual parts of the group (Timinger 2017). However, the retrospective should not only be a space to lift individual members out of the comfort zone and



into the learning zone, but much more to encourage the whole team to improve. For this, it is important to create a framework in which constructive criticism and suggestions for improvement are not seen as personal attacks (Dräther 2014).

The step into the learning zone represents a classic change process, which is accompanied by the Scrum Master. He/ she ensures that an atmosphere free of fear is created. In addition, there must be enough room for creativity so that the participants can develop their ideas. The selected methodologies should aim to ensure that all participants are able and willing to actively participate to jointly conduct a root cause analysis of the obstacles in the team and in the project (Hanschke 2017).

Especially with newly formed teams and untrained team processes, there is a risk that conducting a retrospective will have a negative impact and that individual team members will slip into the panic zone. Since the Scrum Master is also an active part of the team, the basis for a successful cooperation of the team must be created at the beginning to exploit the full potential.

In various projects in the context of courses at the university, it has been shown again and again that in newly formed teams the retrospective was not carried out or only performed on the surface. These projects are conducted via the Co-Innovation Lab platform (Günzel et al 2019) to obtain as real situations as possible with genuine challenges and companies as clients. It was shown that the students were theoretically aware of the procedure of a retrospective but did not generate any added value due to the lack of practical experience, due to the new situation and due to the avoidance of critical questions.

Based on the problem definition, the following research questions can be stated for the paper: What is the basic acceptance and application of the retrospective by newly formed teams using the example of the Co-Innovation Lab? Why is the usefulness and necessity of retrospective questioned? How do interpersonal and personal factors influence the implementation of the retrospective? To what extent can the use of virtual assistance increase the acceptance and application rate of the retrospective?

Unsuccessful execution of retrospectives in new teams

As part of the execution of several projects in the Co-Innovation Lab in the winter semester 2020/2021, the acceptance and application of the retrospective was surveyed among the participating students. With the help of an online survey, 24 responses were generated from 62 surveyed students. The respondents were students of a bachelor's and master's program in business administration as well as a bachelor's program in IT, all of whom already had a theoretical background on agile project management and the importance and execution of the retrospective. The survey took place in the first days of the project phase to record the status quo.

One question related to the planned frequency of execution. 35% of the participants answered that they planned to conduct a periodic retrospective at the end of each sprint, 35% planned to conduct a one-time retrospective at the end of the project, and 30% did not plan to conduct any retrospective.

The following question refers to causes of sporadic or missing execution. In addition to the answer options unnecessary (22%), no improvement recognizable (7%) and waste of time (35%), the participants could give their own answer options (42%). Here different answers resulted; from the statement, that the importance of the Retrospective is underestimated as unawareness of its importance or not at all recognized as lack of importance given to it, in addition, on the fact that a bad planning prevents the execution (Simply often not thought of it; lack of time).

Furthermore, they were asked where they see failure or the greatest potential for error and problems within the individual procedural steps of a retrospective (e.g., according to Esther Derby). The biggest challenges are seen in the collection of data (Gather data) with 37% and the determination of measures (Decide what to do) with 44%. However, many respondents also found generating insights (Generate insights) a problem at 6%. Other participants (12%) also criticized a lack of ability for self and team reflection and the obstacle of implementing the derived actions.



When asked what problems prevented, plagued, or hindered the implementation of the retrospective in the past, respondents found many different explanations. Without exception, these can be traced back to interpersonal and personal characteristics (shyness; dishonesty; no respectful interaction, actively putting obstacles in the way). However, planning errors described at the beginning also caused problems (too time-consuming; no one felt responsible).

The question based on this referred the interviewees to a requirement for the retrospective from the literature. The focus was on openly addressing problems and the virtues of honesty and constructive communication. Interestingly, these problems were already independently posed by respondents in the previous question. Answers included "people often have barriers to being honest and don't want to hurt team members" as well as "problems were not addressed directly because people also knew each other personally, the personal relationship took precedence over the professional work." Only one response generated an opposite result ("We communicated clearly and honestly and therefore had no difficulties").

In summary, the basic acceptance of retrospective and its recognition among students in newly formed teams is very low. The survey reinforced the hypothesis made at the beginning of the research of students questioning the meaningfulness and relevance. The problems and causes of this are manifold. However, despite prior knowledge, many participants fail to recognize the added value of the retrospective. Meanwhile, the retrospective tends to be described as a waste of time and unnecessary. Also, the reflection of the entire survey generates the assumption that the students are overwhelmed with the self-organized planning and the agile way of working, respectively, reach their limits. Therefore, agile methodologies of the Scrum process, such as the retrospective, fall by the wayside due to temporal misplanning. Often, the retrospective is not done by choice, but because a retrospective at the end of the project is part of the exam performance (or as part of the project completion). Students therefore see the retrospective as a constraint and a requirement, but not as an aid to optimizing their own and their team's work. The power of the retrospective is simply underestimated, and its potential is not exploited.

Related Work

According to the Scrum Guide (Schwaber & Sutherland 2020), the retrospective is used to find and plan "ways to increase quality and effectiveness." The Scrum team inspects the last sprint in terms of people, interactions, processes, tools. In addition to the issues that went well or problematic, ways to solve these problems are identified. In the literature, a variety of approaches can be found, which are further presented from a classification into question-based, emotion-analytical, big-picture, prioritizing and creative retrospective.

- Question-based retrospective: Basically, methods in this category such as Asking Questions (Goncalves & Linders 2014), Starfish Retrospective (Stein 2015), Sailboat Method (Goncalves 2019a) or the Each One Meets All Method (Fatjak 2013) pursue a long-term improvement idea by initiating discussion in the team through questions. This aim to ensure that continuous improvement of the team, each individual, and the project is driven through execution. Precisely because these formats are adapted to the entry into the agile world and retrospective, an attempt is made to create a trusting environment, which, however, does not immediately result in constructive execution. Rather, teams in these methodologies make the mistake of dealing with feedback and criticism too personally due to their inexperience. This cannot or can only partially be reduced by these approaches. The formats have a fixed schedule, which restricts creativity and freedom of thought or makes them disappear. On the positive side, however, the participation of each individual is encouraged by the concrete specifications of the methodologies.
- Emotion-analytical retrospectives: This category is suitable for teams facing fluctuating emotional difficulties. The Happiness Index (Goncalves 2019b), One-Word Retrospective (Linders 2013), the Appreciative Retrospective (Retrospectivewiki 2013) or Strengths-Based Retrospective (Linders 2013) try to score with a special focus on the psychological level and specially to create trust and space for constructive criticism, openness and feedback.



Furthermore, the idea of continuous improvement is also followed and lived. The emotion-analytical retrospectives try by their structure to motivate the participants to take part in the execution but seem mostly very unchangeable and leave little room for creative and innovative approaches. The templates found in the literature always try to fulfill the points of root cause analysis and action planning in order to add value to the further course of the project.

- **Big Picture Retrospectives:** This category aims to create a Big Picture. This type of retrospective, such as the Fly High Retrospective (Linders 2014), the Spider Web Retrospective/Team Radar (Derby et al 2006), or the Amazon Customer Review (Baldauf 2020), scores particularly well with the overarching planning, execution, and follow-up of root cause analysis and subsequent action planning. Teams that choose this form of retrospective generate very helpful documents and problem maps during the exercise, which can be integrated in the next Sprint Planning. The rather open execution of the retrospective exercises allows the participants to incorporate their own ideas, ways of thinking and views and has a positive effect on the motivation to participate. The team finds a trusting environment that invites open discussion with a healthy feedback culture and honesty.
- **Prioritizing Retrospectives:** The focus is on generating and prioritizing actions. This line of business scores particularly well in terms of root cause justification, analysis, and the associated derivation of actions that result in optimal improvement at the team or organizational level. Typical representatives are the Plan of Action Retrospective (Caroli & Coimbra 2020), Top 5 Retrospective (Bowley 2013) or the Deep Tissue Massage Retrospective (Mamoli 2015). The constant drive for improvement can cause the team's motivation, desire, and commitment to participate in the retrospective session to suffer. In addition, in certain cases, the setting of the retrospective can be more like a tense meeting and create anxiety and closed-mindedness among participants. This ultimately risks participants ceasing participation out of self-protection or becoming too personal and attacking with their statements.
- **Creative Retrospectives:** In this category, retrospectives are conducted in a playful, off-topic manner that brings out creativity and personal responsibility. Nevertheless, the trust-building and constructive atmosphere can often suffer from the lack of seriousness of the methodology. In the end, the implementation of such a methodology as the Giphy Retrospective (Müller 2020), Card Game (Dellnitz), or Retro Game (Stoll 2017) only partially aims to generate useful output. Depending on the often-missing striving for improvement, the aspects of root cause analysis and action planning are only partially implemented. The focus is on creating variety and increasing the fun factor in often deadlocked projects and teams.

Chatbot-supported Retrospective

From the research conducted within the framework of the study, it has been shown that the steps of information gathering, analysis and measures derivation are the biggest issues of retrospective in the phase of team formation. All existing methods are unable to reduce the risk of unsuccessful implementation in the constellation of new and inexperienced teams. Therefore, the goal of improvement is not to improve the pre- or post-processing of retrospective meetings, but to focus on the integration into the meeting itself.

Initial articles and research integrating chatbots into retrospective execution show the potential. Matthies et al. (Matthies et al 2019) focused on integrating a chatbot into the retrospective communication and tracking process. Remy Sharp (2019) addressed the integration of a chatbot into virtual communication using the tool Slack. Here, the chatbot initially acts a collector of retrospective input from developers, who sent it to the chatbot via message. The



chatbot then presented this information for prioritization in the development team's communication channel with the goal of highlighting the top three areas for improvement.

The chatbot presented in the following should not only structure and guide the retrospective, but also collect and evaluate data from the team to intervene and derive actions with the help of this data. Optimization through a chatbot is to be based on the ideal-typical process of Derby et al in that the integration of a chatbot supports these phases as a neutral third party to focus the team in the first phases of team building.

Basic framework of the chatbot-supported retrospective

The chatbot-supported approach uses Ester Derby's (Derby et al 2006) flow as the basic framework of retrospective (see figure 1). Analogously as described by Goncalves & Linders (2014), "learning by doing" will produce the version appropriate for the team.

1. Set the Stage: Retrospective participants are mentally picked up and prepared for the main part of the retrospective. The content can be introductory questions, which are either off-topic or aimed at inquiring about the general well-being of the members. Here, the literature likes to refer to the visualization of the personal feeling of the participants. Another way to make the start of the retrospective successful is to consciously ask the developers about the process and content of the last sprint to revive what happened. It is also important in this phase to create the aforementioned framework or the required atmosphere (Derby et al 2006).
2. Gather Data: information is gathered about what happened in the last sprint. Even if the sprints are managed together by the developers and are characterized by daily exchanges, this does not mean that every member of the group shares the same impression and perspective on the past. Pooling information in the form of views, opinions and experiences expands everyone's views and creates a holistic picture. This is the only way to advance to the next stage (Derby et al 2006).
3. Generate Insights: The goal in this step is to optimize the work of the developers in terms of a better cost-benefit ratio. A central role here is to rethink the concrete processes and not to draw hasty conclusions. Here a sustainable thinking and consideration of the problems is more advantageous than only solution-oriented thinking (Derby et al 2006).
4. Decide What to Do: The main focus is on prioritizing the suggestions for improvement. A too comprehensive list of changes for the next sprint would only lead to disillusionment in the next retrospective and affect it adversely. It is important to keep the right balance between feasible improvement potentials and too utopian ones. Finally, a concrete overview should be created during this phase to incorporate these points in the next Sprint Planning (Derby et al 2006).
5. Close the Retrospective: Like the beginning of the meeting, concrete questions should round off the session and record what added value the invested time enables. To exaggerate, one could even conduct a separate retrospective session to analyze whether the actual retrospective went according to plan and achieved a usable output (Derby et al 2006).

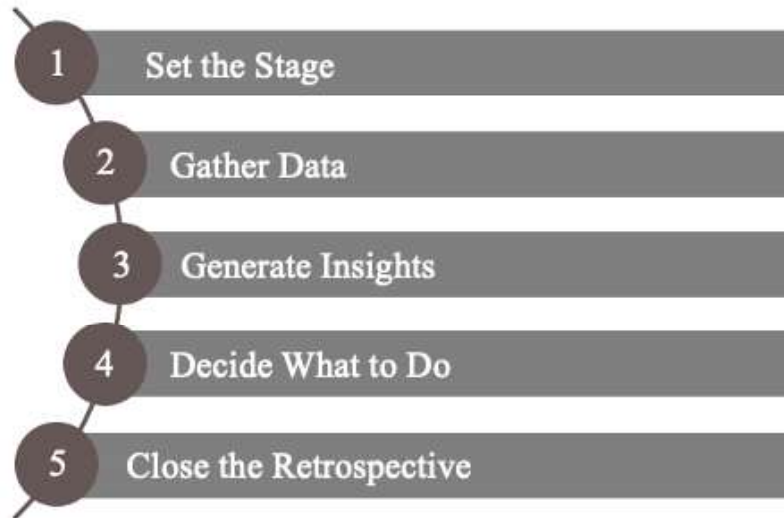


Fig. 1. *Structure of a Retrospective (Own representation based on Derby et al 2006)*

Support by the chatbot

The approach is based on the concept of "Asking Questions" according to Goncalves & Linders (2014), which is adapted to support the Scrum Master and Developer. In general, the idea is that by asking questions of the chatbot (figure 2), developers generate answers to these questions. These results are processed, documented, and integrated in the next sprint to improve the processes. The questions are not permanently fixed, but can be adapted, deepened or made more complex depending on the knowledge level of the Scrum Master and the developers.

Starting with Norman Kerth's four core questions (Goncalves & Linders 2014): 1. What did we do well as a team and is important to discuss? 2. What have we learned as a team? 3. What should we change as a team in the next sprint? 4. What is still unclear? Just the open posing of the questions challenges the group members to think logically and ends naturally in a discussion, moderated by the Scrum Master. These introductory questions are initialized with open-ended questions about collaboration, technical set-up, or perspective expectation, and are supplemented with more detailed questions over the duration of the project. Follow-up questions can also help achieve the desired outcome of the retrospective.

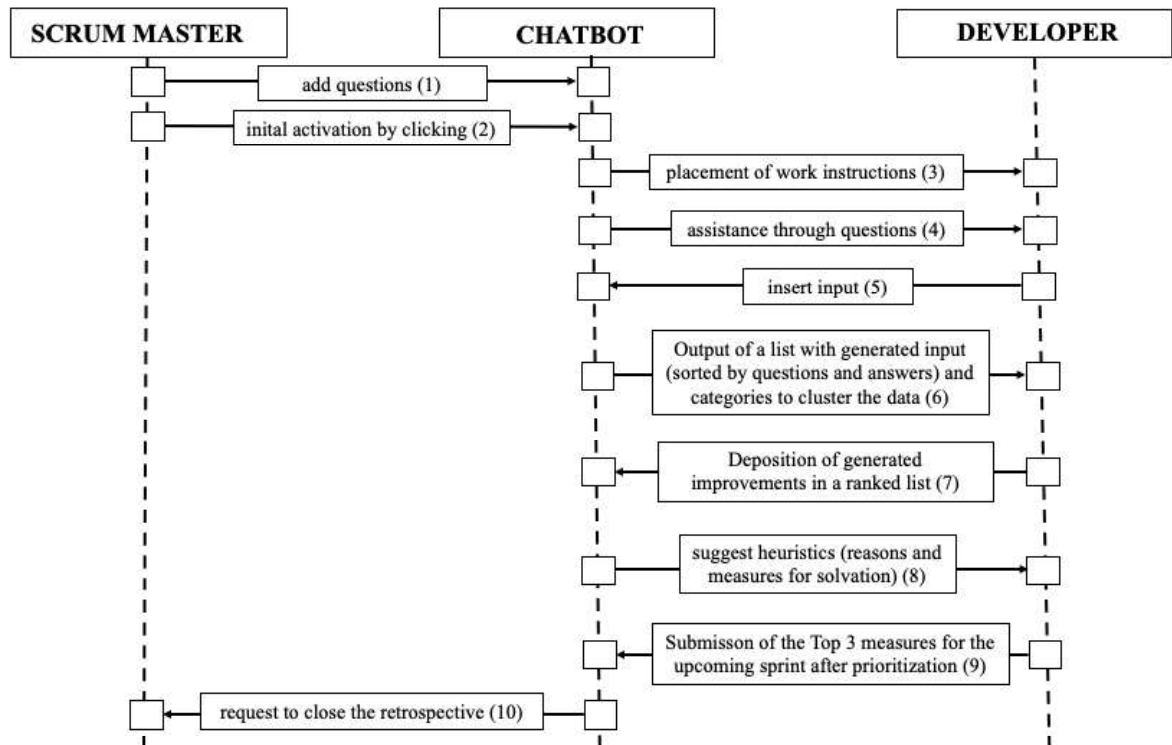


Fig. 3. *Interactions between Scrum Master, Chatbot and Developers*

Evaluation of the concept

In addition to the qualitative research method used, the results in the test groups are discussed below.

Scientific Method

The research design used is based on a model approach that can be traced back to Jan Recker (Recker 2013). This three-phase way of thinking builds on the pillars of rationalization, validation, and exploration, determined by conducting inductions, deductions, and observations. Here, exploration revolves around what is determined in the execution of the retrospective in the Co-Innovation Lab. Care is taken to ensure that the research is always concrete, reliable, and authentic. By observing the retrospective, a basic understanding of the status quo and requirements is established in the first instance. The next building block is rationalization. The focus in terms of the work is to classify the observations made and to generate and make sense of generally applicable theories regarding the research questions. Finally, the validation follows. This is about deriving a conclusion from hypotheses. This is done by testing the hypothesized theory by conducting surveys.

In this work, both quantitative strategies and design science methods can be found (Recker 2013). These are on the one hand two surveys, which in the first run reflect the current situation in the Co-Innovation Lab and in the second run the experiences directly after conducting an experiment on a possible future retrospective approach. By means of a Wizard Of Experiment the participants were confronted with a non-existing system for testing. The goal was to generate



meaningful research results in the short time available by simulating a real system (Bernsen et al. 2016).

Results

A total of 14 student volunteers from four different teams participated in the test of the chatbot-supported retrospective as part of the Wizard-of-Oz experiment and associated survey to gain insight into the applicability of the chatbot-supported retrospective. In the wrap-up of the projects, it was found out that participating teams tended to perform in general better, although the participation was not known to the evaluating instructors.

A total of eight evaluation criteria (figure 4) were considered, among which were the points of participation and interaction, the quality and quantity of contributions, and the general output for the project. In addition, the participants considered factors such as the relationship between time and benefit, as well as usability, comprehensibility, and the structure of the retrospective. The categories of participation, output, and quality scored only average across all survey groups before the chatbot-supported retrospective was applied. The chatbot demonstrably generated better discourse by increasing qualitative and quantitative contributions within each group. In addition, participants recognized a positive impact on the overall output of the project. Collectively, all groups realized a jump from 3 to an average of 4.5 out of 5 points in these categories. This trend was also seen in the remaining four criteria. The criteria usability, comprehensibility and structure recorded a jump to the maximum in almost all groups and even the ratio between time and benefit could be raised in all teams by at least one evaluation point. The chosen concept made it possible to increase the acceptance of the retrospective in such a way that due to the reliability on the different features and the certainty of the formation of an added value for the retrospective, an integration was possible without any problems and will be in the future. The retrospective generated demonstrable usable output for implementation in current or future projects in many of the groups surveyed.

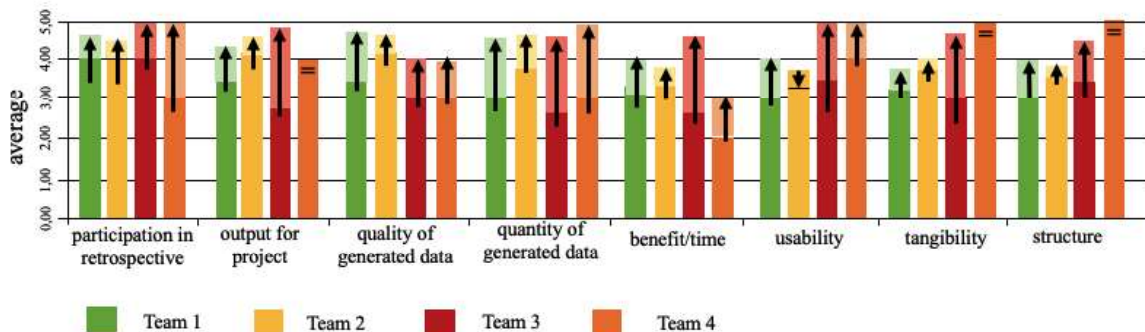


Fig. 4. Evaluation of the chatbot-supported Retrospective

Conclusions

This paper aimed to analyze and evaluate retrospective in newly formed teams in agile projects. Using the university environment Co-Innovation Lab, where students solve challenges with companies, the concept of a chatbot-supported retrospective was developed and tested in addition to the root cause analysis.

Those who are responsible for the Co-Innovation Lab have been aware for some time of the problem that participants do not approach the retrospective with the necessary seriousness or



even eliminate it from the scope of the agile project. Using an online survey, 62 students were asked about this issue, which confirmed the hypothesis. Only 35% of all respondents chose the ideal-typical course of conducting retrospectives at the end of each sprint; 30% of students eliminated retrospectives entirely. Arguments such as unnecessary, no discernible improvement, time wasted, or problems in execution were cited. General templates and procedures could not help in the specific project situations; the Scrum Master lacked the experience and assertiveness to collect usable data and derive actions.

The chatbot-supported retrospective allows to minimize the team's problems in connection with the retrospective by adding a virtual, external coach. Tests and surveys showed that the methodology performed positively in both objective and subjective criteria. Not only did the applicability rate increase, but also the reputation of the retrospective in terms of its importance to the overall project. After conducting the experiment and the online survey, the chatbot-supported retrospective approach was confirmed as a workable approach to implement retrospective and sustainably increased the applicability rate in the surveyed teams. The next step is to implement the concept with a chatbot framework and test it with other projects in the Co-Innovation Lab to extend the previous results.

The integration of artificial intelligence could be further supportive in the future. Through the targeted use of a chatbot, the retrospective in agile projects will experience a significant improvement. In the future, it remains to be seen to what extent artificial avatars will be able to independently take responsibility for meetings such as a retrospective.

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