



# DESIGN PROJECT 2

Remote Meeting Bot

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## Work Breakdown

Robert Falcasantos: I was often scribe, moderated design method discussion, managed the project workspace and did low-fidelity prototyping. I also prepared (slides, robot paraphernalia) and acted out the WoZ prototyping for the robot pre-development.

Eleonora Toscano: Front-end development of the bot & participant in all design phases

Thoams Bruhn: Backend development of the bot & participant in all design phases

Anqi Yang: I actively participated in all the design phases, and put a bit more effort into the final report.



## Problem Statement

As the most direct effect of COVID-19, remote collaboration has become the center of attention where challenges and opportunities coexist. Whereas the appeal for designing better remote working tools has been heatedly discussed to improve the working experience for employees, little spotlight has been shed on university students, who are also undergoing the bumpy shifting to remote collaboration. Although issues for remote teaching are more addressed, group work for college students remains to be the most annoying and tricky experience as the remote context worsened the existing workflow.

Group projects constitute an important part in the study of university students. Mostly aged between 18-28, those university students don't have much solid experience to succeed in collaboration with others from different backgrounds and with different ways of working. The ability to work collaboratively with different people is a core competence when new grads step into the workplace, and team projects in university is the best chance for them to practice and be prepared for their future career. Nevertheless, project

groups, no matter formed with acquaintances or arranged through the match-making of professors, can always experience frustrations regarding collaboration, and the remote working context generates even more new obstacles. Being able to deeply empathize with our target users, we would like to solve the pain point to promote a better experience for remote collaboration for university students.

Compared to remote collaboration in workplace, the remote collaboration for university students are facing different challenges due to the differences in the motivations and objectives:

### **Unfamiliarity amongst group members**

The members of a group might barely know each other before the group is formed, and know very little about others' personality and competence, which increases the difficulties of fostering the group dynamics in the first place.

### **Unclarity in role/responsibility division**

Unlike colleagues in the workplace that have specific responsibilities to carry, members in students' projects lack a clear clarification on the tasks and responsibility each one of them should take, leading to the dilemma of the uneven split of work as well as difficulty in organizing the collaboration.

### **Lack of shared motivation**

Group members might not have the shared expectation for the project they're working on, adding the lack of communication, conflicts appear as a result of mismatched objectives especially when some member is not putting enough weight.

Narrowing down the broad range of problems for remote collaboration of master students, we decided to choose the **remote meeting**, which is the most important part for remote group work, as our focus. Through empathizing with our target user group, we identified following breakdowns that hinder smooth and efficient remote meetings:

### **Incompetence in establishing team dynamics**

Failing to reconstruct the natural face-to-face interaction, remote meetings undermine the social aspect of teamwork and hinder members of the team to get to know each other better, especially when some members are quietly hiding behind the black screen.

### **Organizational problems**

The organizational problems of remote meetings block the flow of work when the group gets stuck in silence or endless discussion. In addition, it adds extra pressure to members when someone has to take the responsibility of facilitating the meeting.

### **Social/engagemental problems**

Furthermore, remote meetings also stifle the engagement for members, in particular when some members are being talkative all times while the more introverted type do not get to speak up for their opinions.

Although remote meetings brought up numerous challenges for efficient and smooth collaboration, the digitized environment opened up opportunities for involving additional aids that have never been mentioned in the on site context. We would like to propose a built-in Bot in remote meeting tools (Zoom in this project), which can help in organizing the meeting, facilitating group rapport, increasing the engagement of members, as well as adding the spice of humor to the meeting.



# Scenario

## User Profile

**Target user:** Mid-20s university student

**Key characteristics:**

1. Opinionated on how other people work
2. Self-conscious
3. Seeks out guidance
4. Wants to do work
5. Looking for roles within a group
6. Not equally motivated for everything
7. Wants to split work equally
8. Doesn't want most responsibility

## Personas

### Passive Patty

**Name:** Patty

**Age:** 23

**Gender:** Female

**Job:** Student

**Characteristics:**

1. Waits for instructions/seeks out someone to tell them what to do
2. Happily does tasks assigned to them
3. Does not want to propose how things should be done
4. Feels awkward to moderate the meeting
5. Prefers not to be the moderator
6. Desire to socialize
7. Desire for human interaction/reciprocity
8. Concerned for the other's well-being

### Proactive Preston

**Name:** Preston

**Age:** 24

**Gender:** Non-binary

**Job:** Student

**Characteristics:**

1. Feels the need to organize the group work in the fear of them doing a bad job
2. Unsure about their performance as an organizer
3. Finds it difficult to encourage the engagement of others
4. Talkative
5. Has initiative
6. Pokes/prod questions to people within the group to engage
7. Desire to socialize
8. Desire for human interaction/reciprocity
9. Concerned for the other's well-being

### + :: Work-oriented Wanda

**Name:** Wanda

**Age:** 27

**Gender:** Female

**Job:** Student

**Characteristics:**

1. Doesn't want to chit chat
2. Focused in the meeting, sticks to the agenda
3. Pressured
4. Prepares for meetings
5. Seeks clear responsibilities and organization
6. Can be proactive and passive
7. Feels awkward to moderate the meeting
8. Doesn't care for other peoples' well-being
9. Struggles to confront free-riders

The User Profile and Personas are results of interviews we conducted with students

In group projects, students work with many different people. Often ones they have not worked with before. In a short period, the students have to learn to work with each other effectively. With remote group projects, groups don't spend time together outside of the project, which makes building rapport hard.

We have learned about many issues students face when working on a remote group project from our interviews. They have problems voicing concern about issues they see, like an inefficient way of doing things, a useless discussion, or an unequal work distribution. They have different expectations of how the group work should look like, and worry about what others think of them.

Our solution is focused on organisational problems and those related to group chemistry. Technical issues, like a bad internet connection, bad audio, or trouble with collaboration software are not solved.

Our bot's interface allows participants of a remote group project to communicate information to their peers quickly and easily. Click a button, and the bot talks to your team. Our goal for this interface is to support the group's work mentality and make it easier for individuals to take the initiative. We split the commands of the bot into three main categories:

- Organizational commands to keep the team on track
- Commands about the engagement of individuals to ensure everybody is on the same page & To make it easy to ask for help
- Humorous commands to lighten tension and create rapport

We assume group members to use these commands when in need of them. If Passive Patty is lost and does not feel like talking, they can press the "I'm lost" button. If Proactive Preston wants to integrate a group member in a discussion, they can press the "Ask opinion" button. Some of these commands benefit from the anonymity the user has. The other group members can not tell who pressed the button, which made the bot talk. It is supposed to help people ask for help or be the "bad guy" and get people working again.

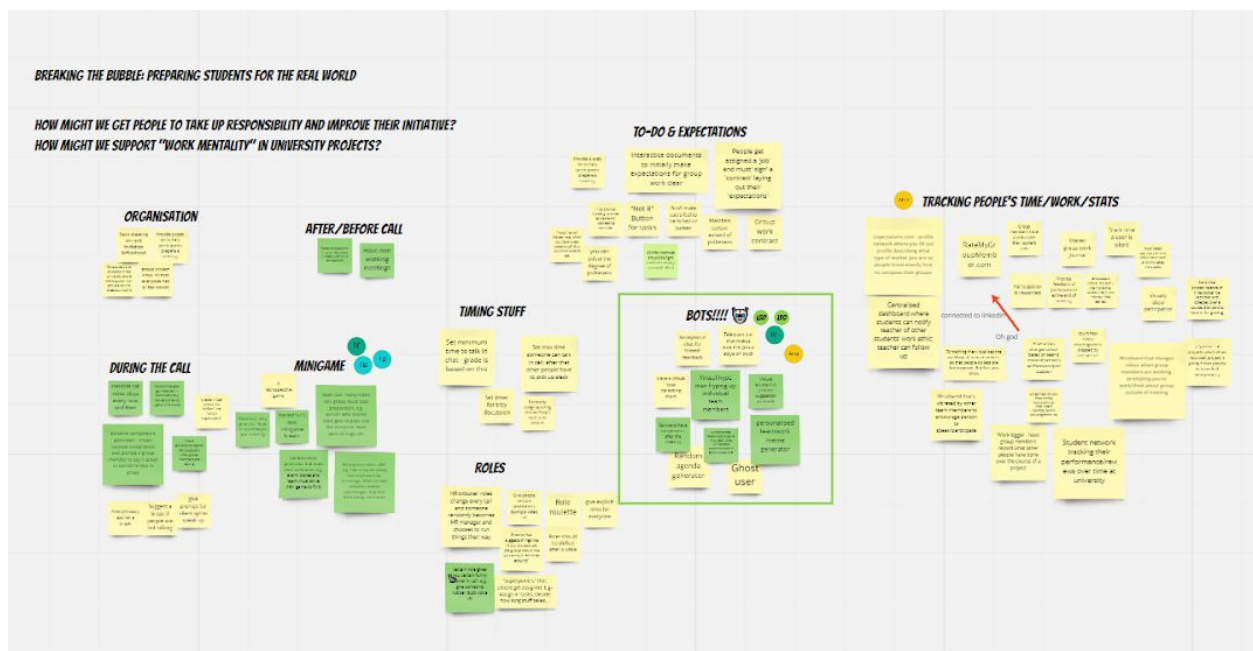
A scenario where the main functionality and (nearly) all commands are seen in action is accessible through this link: <https://youtu.be/2Q-fjtav5Ps>

# Design Details

Undoubtedly, our design process took a defined direction once we decided the *how might* we question to focus on. The selected question was *How might we get people to take up responsibility and improve their initiative?*, so the early title for our project was *Breaking the bubble: Preparing students for the real world*. The idea was to support students in university projects, given the fact that many people we have interviewed stated that they didn't want to take responsibility or be seen as impolite by their peers.

Once we had this defined direction, we brainstormed on Miro to collect ideas around the topic. However, at the end of the brainstorming session we found out that we had focused on the negative aspects of group projects. There were suggestions on how to make the meetings more productive, like tracking the time people spoke or rating group members online. Once we became aware of this, we decided to brainstorm again, focusing on the positive aspects connected with the experience of working with other people.

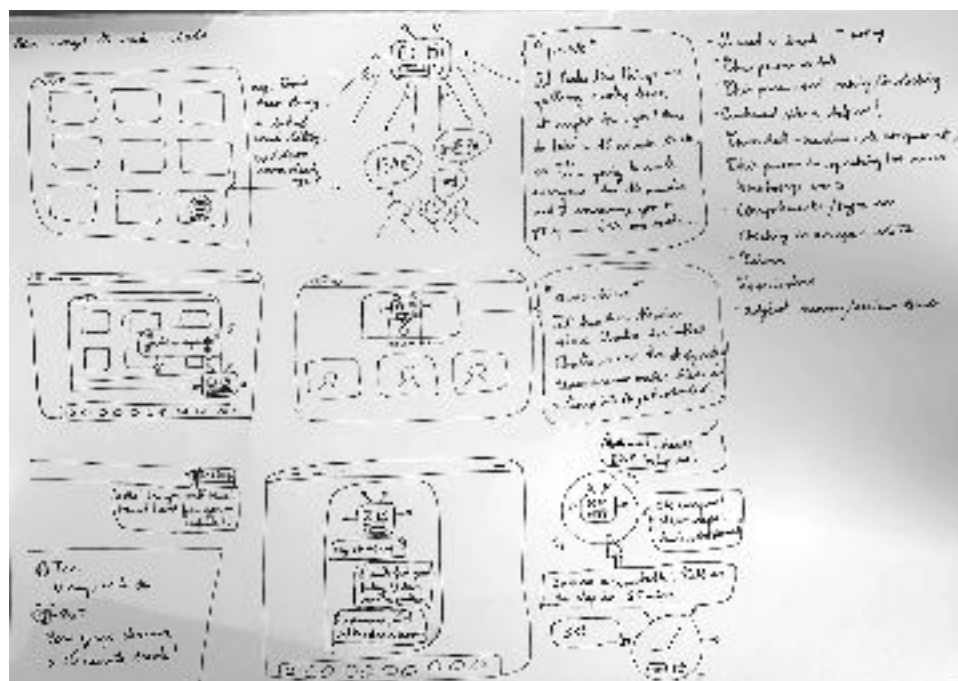
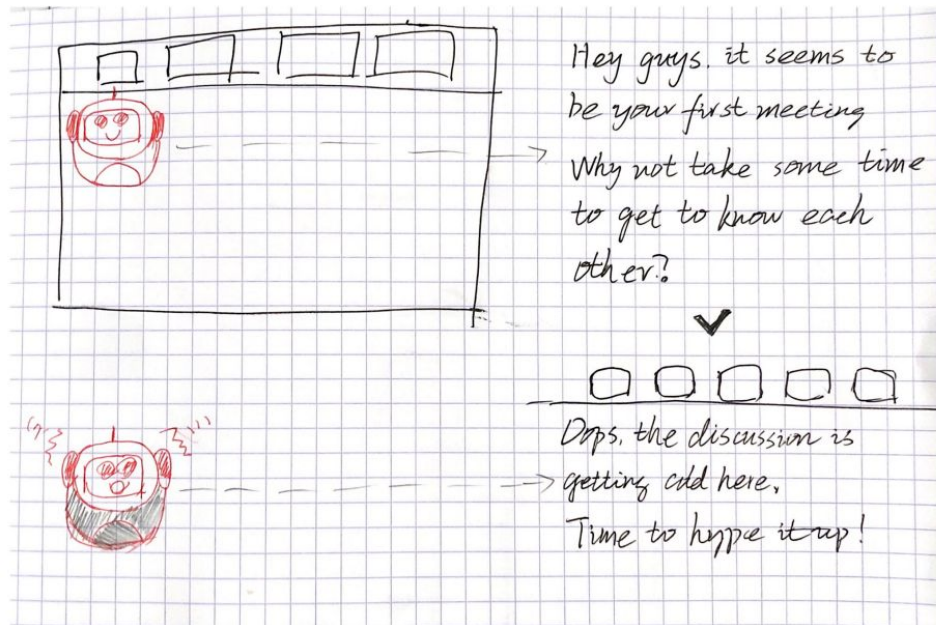
In the image below you can see the result of the second brainstorming session, when we added green post-its.

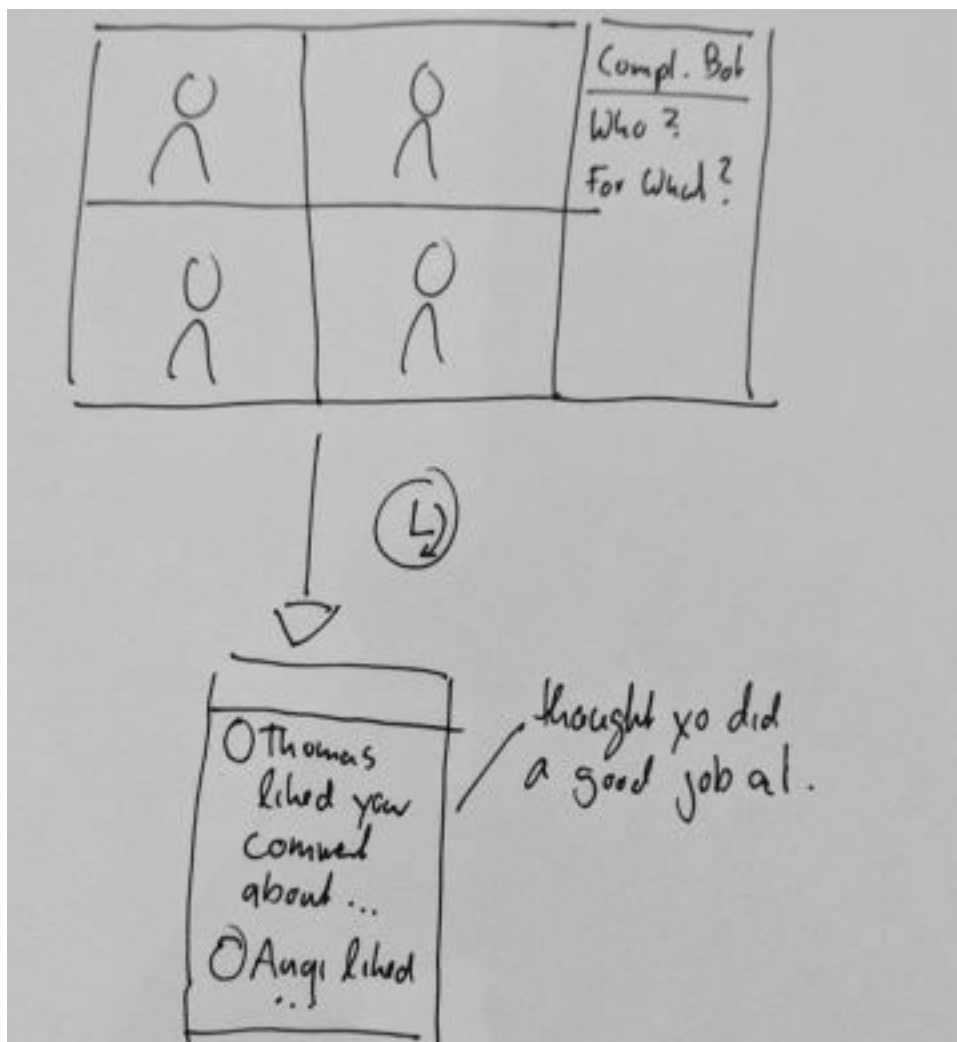
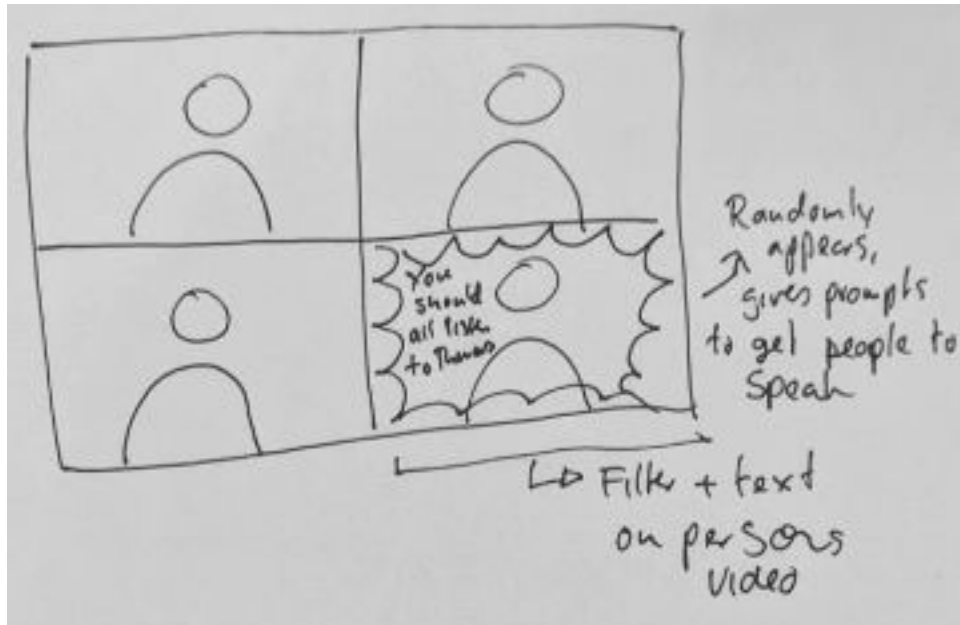


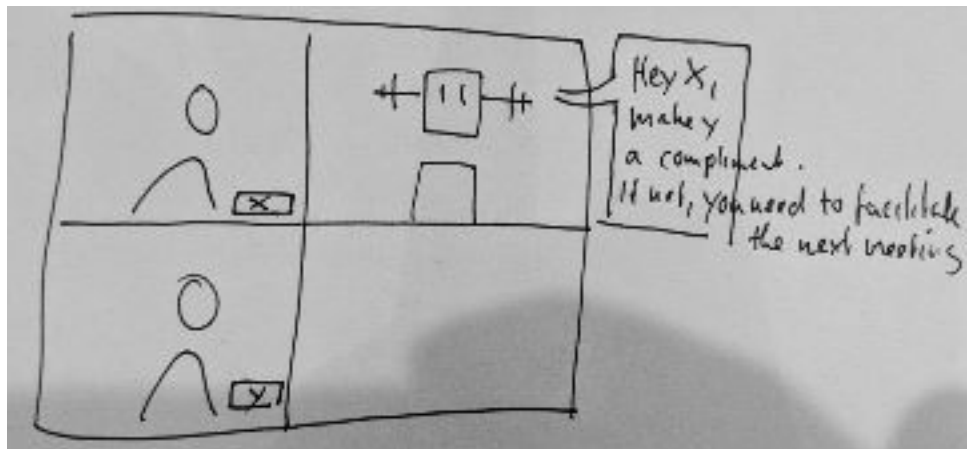
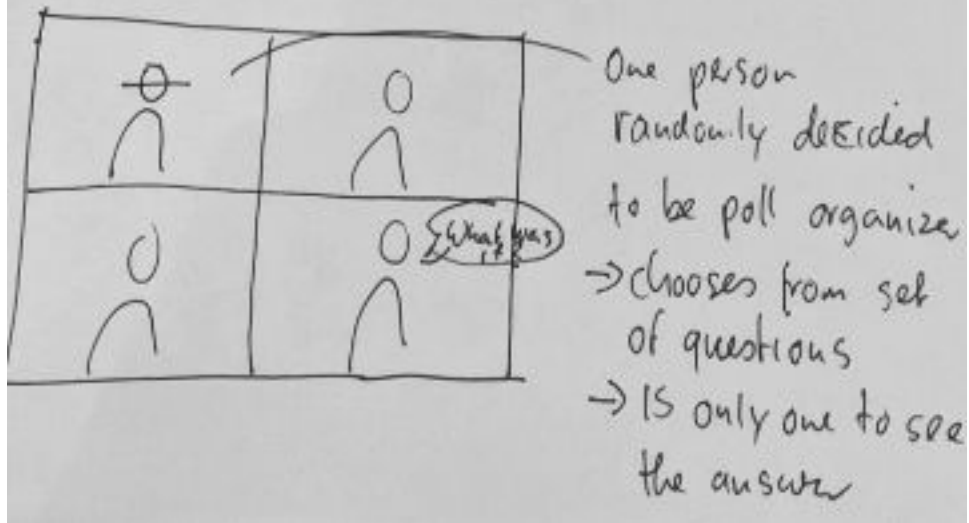
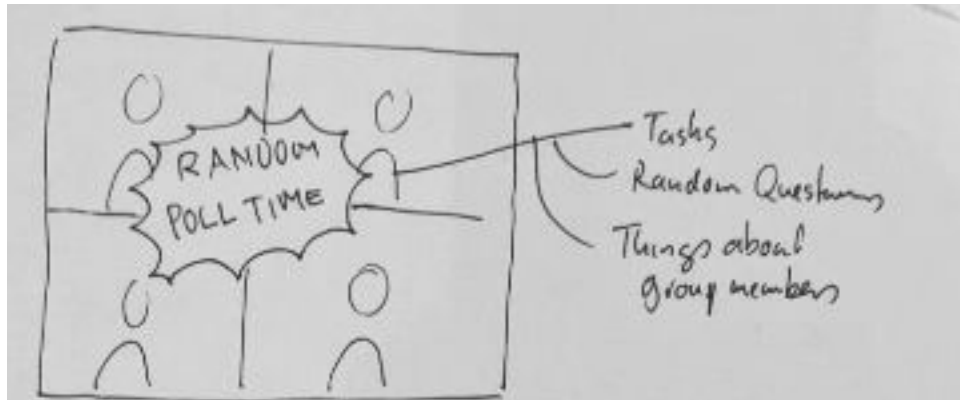


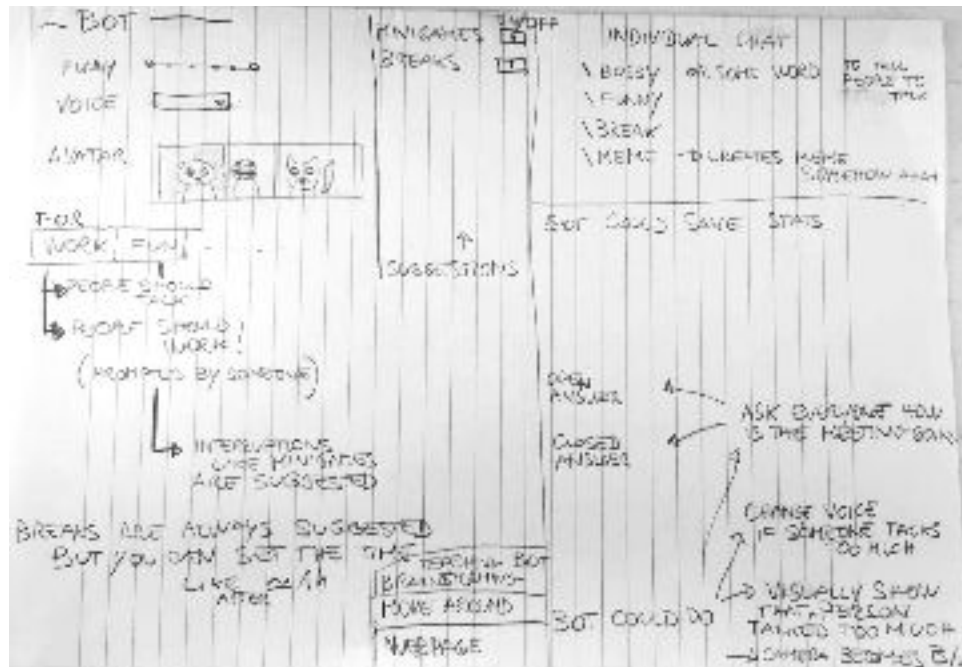
Then, we grouped the post-its in categories, to narrow down the topics. The topic resulting from a vote was *Bots*. This category gave us a lot of possibilities in terms of creativity and innovation. Also it comprised both yellow and green post-its, meaning that the final solution could be a useful and positive tool.

This phase was followed by another brainstorm, this time conducted individually. Each of us sketched possible features and scenarios.







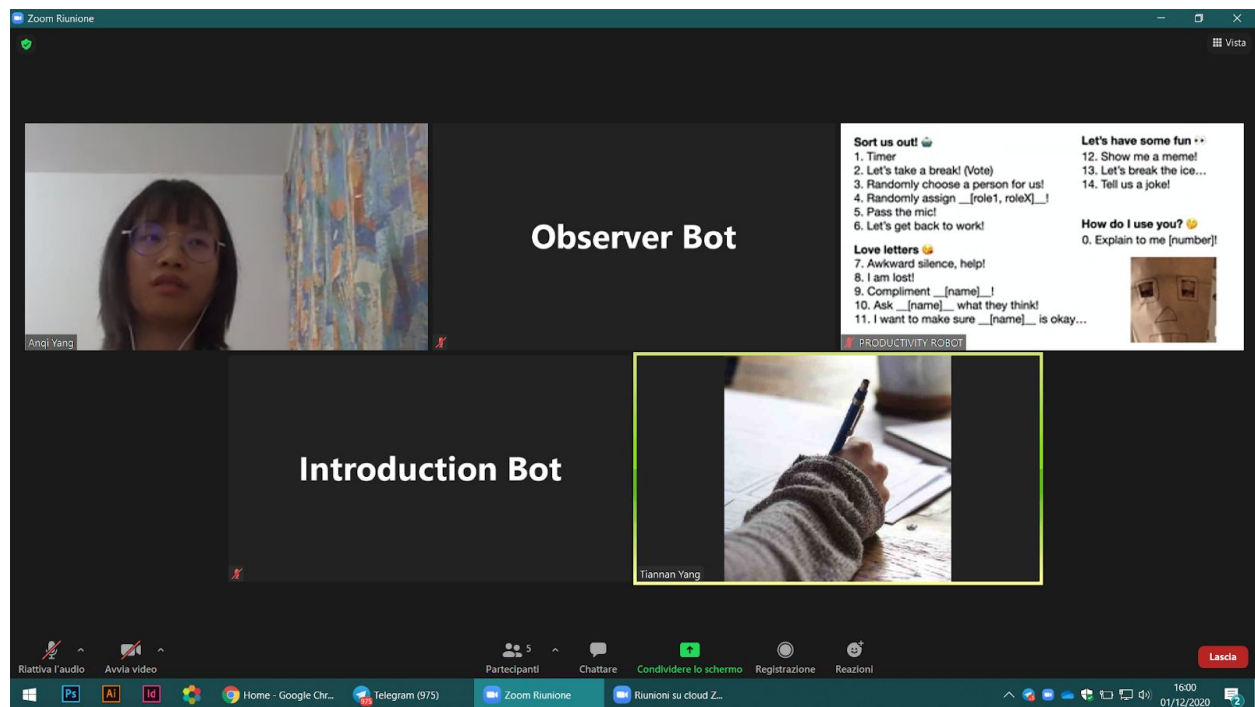


After explaining our ideas to the group, we wrote them on post-its (see image below).



The group decided to test the functionalities of the bot before moving to implementation. One of us would play the bot during some group meetings following a predefined list of actions. We found that some of the functionalities we had written down were not feasible, such as notifying if a participant in the meeting was late, and therefore we discarded them. We compiled a list of the remaining functionalities and their description. We gathered all the resources needed, such as collecting jokes and memes, that the bot was supposed to send. The structure of these test meetings was the following: the meeting was kept on Zoom. One of us was supposed to introduce the functionalities of the bot at the beginning of the meeting. Participants were asked to try out a command to check that they had understood how to use the bot. The bot was impersonated by one of us and participants could communicate with it through an external chat (Telegram), while using Zoom. The person playing the bot had displayed the list of commands in their camera view and to send a command participants had to send the number corresponding to the action they wanted.

Below you can see one of the test meetings we had. To anonymize the person playing the bot they put a paper bag on their head and all the other team members changed their name to *Bot*.



These test meetings proved to be extremely useful, since they showed us some major issues of our concept. We redesigned the interaction of how the user was supposed to use the bot. A participant stated that it had been extremely difficult to communicate with the bot while speaking with the other team members. For this reason we opted to move from textual input to buttons, to facilitate the usage. This way the user could simply press a button to send a command. Moreover, we understood that a critical issue was due to the fact that every time a participant called a function, the bot started speaking right away, interrupting the conversation. Hence, we decided to introduce messages by the bot with a jingle, in hope that it would give the conversation some structure.

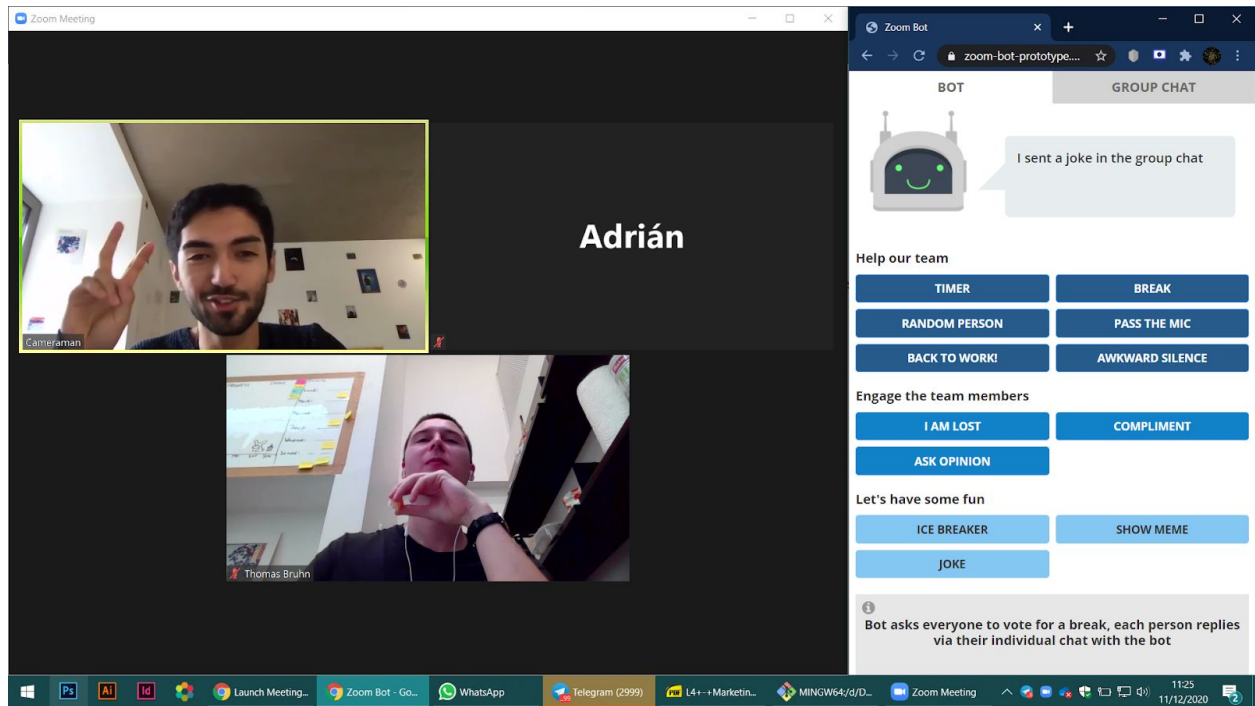
Despite all the insights we collected during these test meetings, there were some constraints we could not overcome when we discussed how to implement the bot. The major constraint we had to overcome was the fact that currently it is not possible to implement a shared bot in a Zoom call that can also participate in the meeting. For this reason we decided to implement the bot as a website. Not only this allowed us to implement all the interactions we wanted to insert in the bot, but it also allowed people to use our tool without being limited by the platform chosen for the call.

All the functionalities we have originally ideated were put in the bot except the one that required a private connection between two users. The implementation was done using Node.js, HTML and CSS. It uses a Server/Client structure: the user(client) calls a command that is sent to the bot(server), which sends a message back to all the users (clients). This allowed us to maintain anonymity when using voice messages. If a client called a command and the bot replied only to that certain client, the other people in the call would hear the bot through the speaker of the person calling the command.

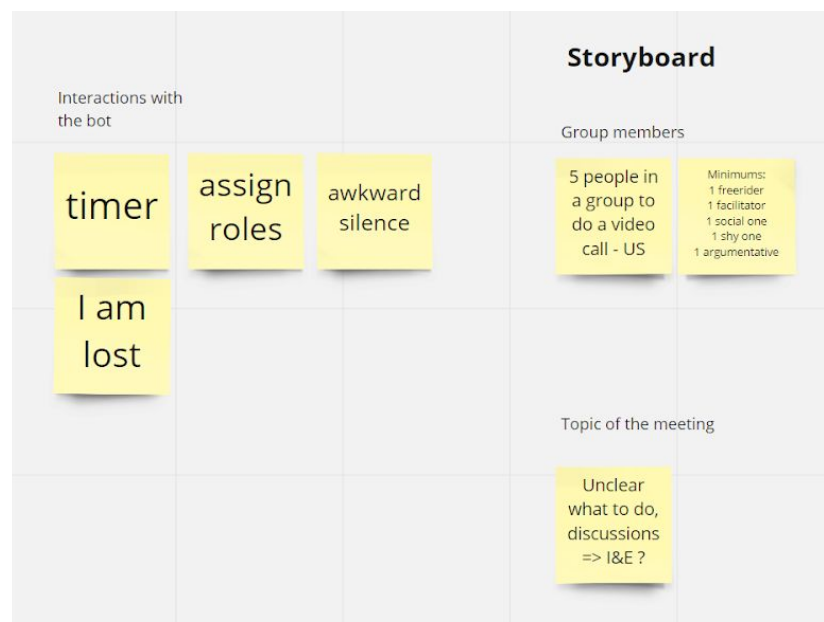
The user interface of the final prototype consists of a “fake” Zoom chat. The *group chat* tab is supposed to represent the actual group chat present in Zoom. Here users would be able to send messages to the group (not implemented since it is already part of Zoom) and to preview messages sent by the bot. The other tab, the *bot* tab, is used to send commands to the bot. All audio messages are played at the same time by all the clients connected.

Below you can see the implemented prototype. The bot displays some information regarding the command the user has called and it also shows, at the bottom of the page, a description of the function connected to the button the user is hovering.





Finally, we wanted to present in this course our design in a cohesive way, showing all the bot functionalities used in context. Therefore we decided to create a video of our prototype. We recruited some of our peers and each of them picked a role to play among the list present in the storyboard (see below). We didn't give our actors an actual script but only described what was supposed to happen.



At the end of the meeting we collected all the footage from our actors, to have the recording of what they saw and clicked. With all this material we have created a video to keep as future reference of this project. You can find the link to the video in the section below.



## Suggested Evaluation

Limitations on Zoom's side as of writing makes it impossible to develop a final system, as Zoom does not provide an API that connects to their software's chat functionality through which we can implement a productivity bot tab. Therefore we would be obliged to evaluate your current prototype (a separate web app to be used alongside Zoom, effectively "replacing" Zoom chat). This has, however, the advantage of enabling users to use this bot no matter the video conferencing software they use. As it stands, our prototype is mostly fully developed and can be seen used in practice in [this video](#). What is yet to be implemented is a group chat functionality and having the robot say a user's name through speech generation software.

Suffice to say, our prototype is developed enough that it can be used successfully in practice and therefore we suggest a future evaluation that seeks to explore its limitations and best-case usage scenarios. We would seek to see in practice both through actively observing a video call as well as through asking a participant to record their screen to gather observation data less affected by the Hawthorne effect.

We have observed and tested exclusively with medium-sized teams of five to six, meaning that we are missing data on its effectiveness in small teams of less than five and large teams greater than six. We would seek information on which features are most used in relation to the size of groups, e.g. whether the "choose a random person" functionality be used as much in a small team where it may be easier to delegate tasks and responsibilities than in a large team.

As our prototype evaluation develops and matures, we would seek to go more in-depth by actively qualitatively coding the events of video calls, then associating the bot's usage to



understand where the bot has functionality gaps. For example, we may find that the bot is perhaps used mostly in “tense” situations and may require us to design a solution or function that enables the deescalation of such situations. We may also find the opposite: that the bot is completely disregarded in such situations and may only be used in calmer situations. Such coding and evaluation would provide us insights and opportunities for improvement regarding the human-bot relationship in-call.

Finally, we would seek to perform longitudinal evaluations whereby we follow and observe the usage of the bot over the duration of a group project, from the formation of the group to its dissolution. So far our observations and evaluations have only seen a given group’s first interactions with the bot, meaning that their usage and perception of the bot is inherently affected by the novelty of the bot. It would therefore be crucial to measure the efficacy, effectiveness and utility of the bot over time to see how much the novelty aspect affects people’s perceptions of the bot. Such a longitudinal study would measure all of the aforementioned evaluation methods as well as require active surveying and interviewing before, during and after the completion of the group project. Our overall goal would be to understand user perception and its evolution as the bot accompanies them through their group work.



## Discussion

In a nutshell, we designed a bot in remote meeting software so as to aid the flux of smooth collaboration. By proposing such a remote meeting bot, we aim at fostering a harmonious meeting atmosphere, improving team members to take initiatives as well as ensuring a productive meeting in a well organized manner. We developed a stand alone website for the bot and get it to work together with Zoom, in order to simulate how such a bot should function as a built-in part of remote conference software.

In this design, we chose to use a bot as the medium of providing meeting facilitating functions due to its unique benefits: First, compared to solely command and buttons, introducing the idea of a bot helps to posit its utilization at a special place of users mental model, which distinguishes the bot from other mundane functions. Second, given the goal of facilitating remote meetings, the bot resembles more to an assistant that offers help

throughout the meeting. Plus, the bot idea can be seen as a lightweight add-on that incorporates versatile functions for meeting facilitation, therefore, this bot idea should also be able to be easily applied to softwares other than Zoom. Lastly, the bot is designed to respond in voice, as we noticed that text messages in group meetings are always ignored. Thus, it's necessary to promote the bot to a more notable status by using voice message during remote meetings.

Another key advantage in our design is the anonymity of interacting with the bot. We noticed that no matter what kind of roles team members play, it's common for them to feel uncomfortable when they have to be the "bad guy" to lead the meeting and poke the passive members, and members sometimes are too shy to ask for help when they get lost. To tackle the mentality of "don't wanna stand out", we stress the anonymity of the remote meeting bot, meaning that once a member triggers a certain function, the entire team should receive the same message without disclosing who the message is from. We believe that such design can not only address the problem for active team members, but can also help the introverted ones to express their feelings.

Through our design process and pilot testing with peers, we also noticed cases when the designed bot failed to play an active and effective role, and we would like to focus on improving those flaws in the future work:

Firstly, the bot is sometimes interruptive and abrupt in the meeting due to its nature of real-time response, namely that the bot will react right away once a command is triggered. In our design interaction, a jingle is added before the bot speaks up to give the audience a heads-up of its appearance. However, this approach failed to solve the problem of the bot interrupting the ongoing conversation. In the future, we would like to explore the possibility of only letting the bot respond when there is a certain gap in the conversation, avoiding the brutal cut in that distracts users.

Secondly, during the 3 user testing we conducted, we always involved an oral introduction of how to use the bot by one of our team members, meaning that we haven't tested the situation when users need to get on board by themselves. Therefore, an easy and intuitive tutorial to guide users to try the bot design out is a crucial step in our future work. In addition, we are also very interested in how the bot will work for proficient users, meaning that users might grow preference towards specific functions while neglecting others over

time. A follow-up feedback from users after performing with the bot for a while would be valuable for the design team to come up with further iteration and redesign.

Thirdly, we also noticed the fact that since all 3 user testing we conducted is accompanied by our team members, we need to take into account the Hawthorne Effect, which might cover up the true reaction and feeling of the users as a result of the presence of the design team.

Fourthly, even though we aim at design a bot that can be utilized by all members of the team, no matter what “role” they are playing, we still noticed that mostly the active team members are the avid users of the bot, whereas the passive members seem to have less interest in interacting with the bot. This situation is understandable since some passive members are only willing to put limited effort into the meeting, there’s no surprise that they pay very little attention to adopting the new bot tool. Therefore, we can see 2 paths forehead: 1) keep exploring how to create more interaction between the bot and passive members, or 2) focus more on the active members and provide them with more functions

Lastly, we got feedback about the distraction and pressure during the initial user testings when participants need to shift between Zoom and Telegram to use the bot. We redesigned it by “integrating” the bot within Zoom, and replaced sending text messages to trigger the bot with simply clicking buttons. However, the button design might yet to be the optimum solution, as users still have to be very familiar with what functions are provided, to find the right one they would like to use, and to interact with the function. Such a series of decision making and interaction can still be distracted and require quite some attention for the users, which will affect the ongoing flow of participating in the remote meeting. Therefore, we would like to seek better design in the future that can minimize the possible cognitive load that users need to bear when interacting with the bot.