Project

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***Abstract*—Zoom is a video conferencing platform. This document will serve as a report for investigation for improvements to the interface. Improvements will be especially focused on to how to better facilitate communication on the interface. The interface changes will largely be based on user feedback and the results of the investigation.**

1. INTRODUCTION

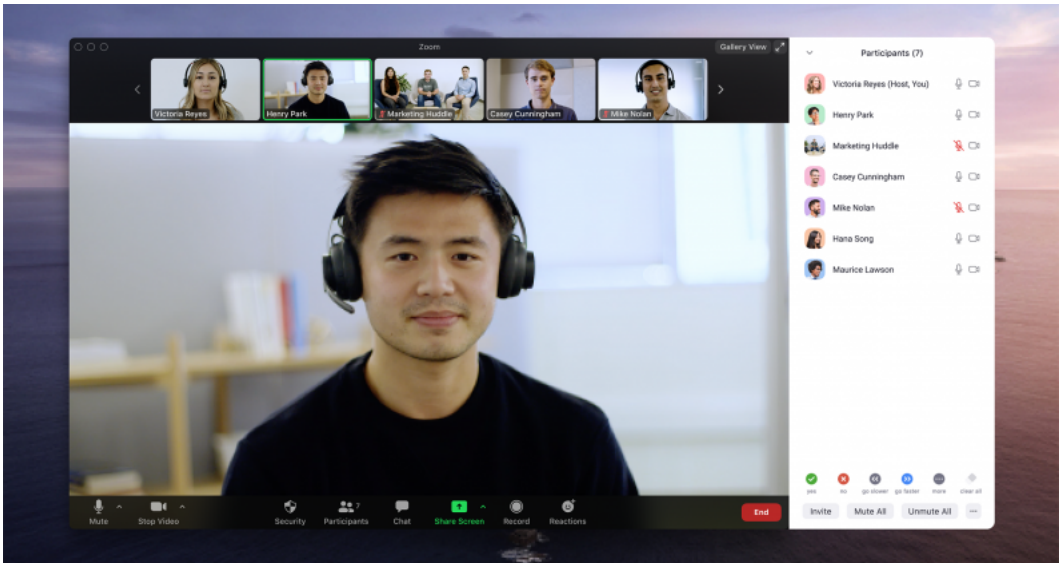

***Figure 1*—Example of Zoom Interface during a meeting. Source: Official Zoom Website**

1.1. Interface Description

Zoom is a widely known video communication platform. Due to recent events the popularity of the app has surged. To access Zoom go to zoom.us and download the app. After downloading the app create an account and start a meeting. It is possible to invite friends and family to your meeting. Once the meeting has started, the interface to speak with people will open. There should be multiple

windows on your screen, representing participants in the meeting. If a participant is not sharing video, the screen is usually black or showing a static image.

2. NEEDFINDING

2.1. Problem Space

The present interface does not give allow for an accurate representation of people in the situation of being present but unable to share video. This is a weakness because it inhibits user participation in the meeting based on whether or not video is able to be displayed. It also discriminates against users that may not have a camera available.The initial needfinding activities will be used to evaluate the truth of the preceding hypothesis. To this end a survey will be conducted to identify user needs. Along with the survey, a review of help forum will be conducted to identify potential bottlenecks in the current interface as well as to identify the current state of video-less user of the Zoom interface.

2.2. User Types

Due to current global circumstances, the user types will range in age and gender. The initial need finding will focus on adult users. There may be differences in level of expertise in the use of technology, so users can be divided into expert level users and novice level users based on their experience with the use of Zoom.

2.3. Survey

2.3.1. Plan

The first needfinding activity will be to conduct a survey. This will likely be given to a wide array of users but mostly undergraduate students and OMSCS students. The survey will be used to identify user needs and tasks. The following questions will be asked.

- How often if at all, do you use video conferencing platforms?
- I would describe myself as very proficient with technology?
- What is your preferred video conferencing platform?
- Why do you use this platform?
- The video quality on my platform is very reliable.
- I prefer to have my video turned off during meetings.

- Are there any changes you would like to make to the platform?

2.3.2. Data Inventory

The survey will help to identify novice and expert users as well as **identify differences in preferences on how to complete tasks and subtasks**. All users will have the common task of successfully communicating during a video conference meeting. Questions will be used to **identify some of the subtasks including turning video on and off as well as, internet connectivity, and identifying video quality.** Users will also be asked to identify common missteps in the usage of the interface.

2.3.3. Biases

Confirmation Bias will be avoided by specifically looking for evidence contrary to pre-existing beliefs. **Leading Questions** will be avoided by having a peer review the questions put out for the survey. **Social Desirability Bias** will be avoided by phrasing questions in a way that wiki not directly ask users about the investigator's solution. **Recall bias** will be avoided by not avoiding asking questions that require the user to remember specifics about the interface.

2.3.4. Report

The raw data from the survey can be found in *Appendix 9.1: Survey Responses*. From the survey, the frequency of interface use, the context of the task, and commonly requested features were identified. As we can see in Figure 2 the majority of users identified as being frequent users of videoconferencing platforms.

The right chart in *Figure 2* shows that the majority of users surveyed identified as technologically proficient and as frequent users of video conferencing technology. This is expected when considering the survey was sent to university students.

However, the left chart in *Figure 3* suggests that a majority of users prefer to use video conferencing platforms without having their own video turned on. This even if, as the left chart in *Figure 2* shows, the video quality is reliable.

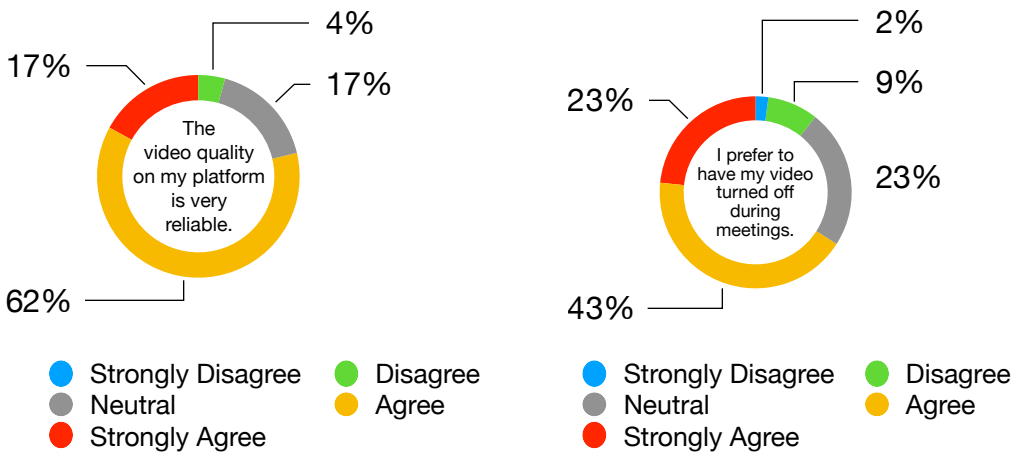

Figure 2—(Left) Chart showing video reliability, (Right) Chart showing video settings preferences amongst users.

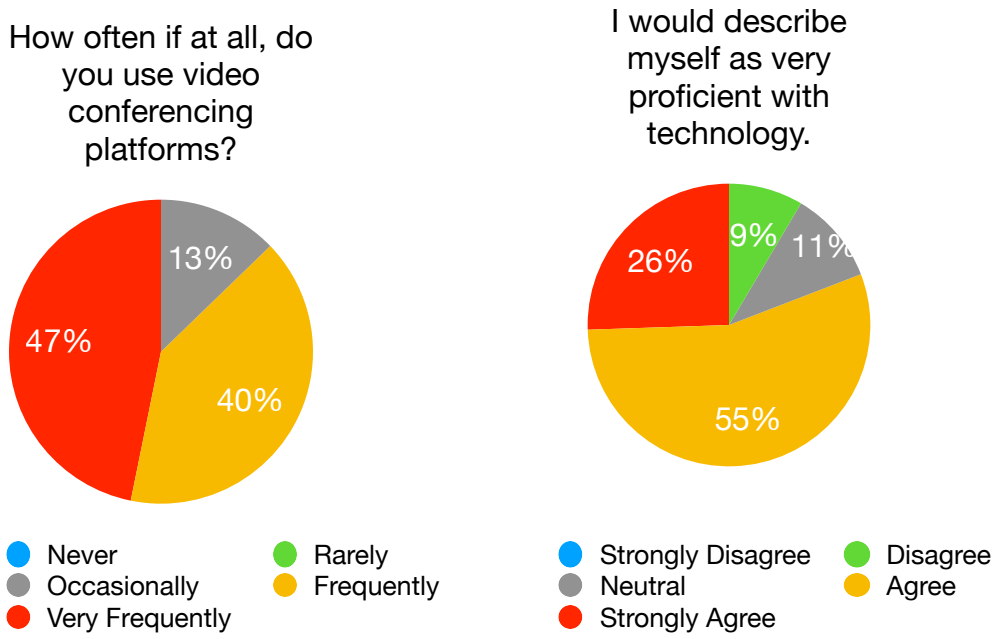

Figure 3—(Left) Charts showing video conferencing frequency, (Right) Chart showing technological proficiency reported by users.

2.4. Help Forums Investigation

2.4.1. Plan

The second need finding activity will be to read reported problems on help forums. The investigator will take note of the frequency of reported problems. The existing solutions to common problems will be evaluated to see if the currently proposed solutions can be incorporated into the interface redesign if not already included.

2.4.2. Data Inventory

By reading help forums it is possible to identify the common subtasks that make up the main task of communicating through video conferencing interfaces. This will also result in data that informs the goals of users when performing tasks as well as the needs. It is also possible to identify common errors and slips made by the user which may inform an interface redesign.

2.4.3. Biases

Confirmation bias will be avoided by looking for data that contradicts preexisting beliefs. **Voluntary Response Bias** will be avoided by not leaning too heavily on the results from user reports. It will rather use these views to inform other needfinding activities rather than be translated into an immediate interface redesign. Observer bias will be avoided by using empirical data to confirm the hypothesis proposed by the observer.

2.4.4. Report

The following table summarizes the results of the Help Forums investigation.

Feature	Problem	Request	Qualitative
Audio	5	1	The overall trend was for users to request a way to alert the status of microphone
Video	6	10	Comments generally focused on not accidentally turning on microphone.
Chat	7	4	Comments included where to find the chat and how to respond to other users.
Misc.	8	20	These were general comments that couldn't be classified into the above, usually related to OS or hardware problems as opposed to Zoom problems.

As shown in *Table 1,* common helpful forum requests include microphone status alerts as well as a separation of video and audio buttons.The overall sentiment from users suggests that these are likely the two most heavily requested features from regular users of the interface.

3. HEURISTIC EVALUATION

3.1. What works well?

3.1.1. *Affordances*

The interface leverages the use of **affordances** to narrow the gulf of execution for the user. This can be seen in the use of flashing symbols when users perform actions such as speaking into the microphone.

3.1.2. *Discoverability*

The interface is **discoverable**. The use of icons throughout the interface allows the user to learn the interface. This typically includes the use of icons as well as super user commands that teach novice users how to use the interface more efficiently.

3.1.3. *Mapping*

The interface uses **mapping** to translate experiences that occur outside of the interface into instructions that allow the user to more easily learn the interface. This typically includes something like a shield to indicate security, something with which most users would be familiar.

3.1.4. *Consistency*

The interface is easy for novice users to learn, while still providing more efficient execution options for expert users. The interface also uses labeling that is **consistent** with the interfaces of other video conferencing applications.

3.2. What makes it work well?

3.2.1. *Affordances*

The use of ***affordances*** throughout the interface helps to narrow the ***gulf of execution*** for the user. For example, icons, such as microphones and video cameras, representing functionality are placed on buttons throughout the interface.

3.2.2. *Mapping*

This uses the concept of ***mapping*** as it takes a concept the user is likely to be familiar with outside of the interface and leverages this to help the user to learn the interface. This can be seen in the use of microphone and camera icons.

3.2.3. *Discoverability*

This also means that the interface uses the principle of ***discoverability***, which helps the user learn the interface. The use of affordances throughout the interface adds to the discoverability increasing the ability of novice users to become expert users.

3.3. What doesn't work well?

3.3.1. Slips and Errors

Users often report the common *slip* of accidentally turning on video when they mean to turn on audio and vice versa. This often impedes meetings, for example introducing random noise into a conversation. Replying to private messages is also not intuitive, often leading to embarrassing situations where the entire conference sees a message meant for a single person.

3.3.2. Gulf of Evaluation

The gulf of evaluation widens for users during video conferences because often the microphone is not turned on. However, the user does not know this and continues the meeting to the detriment of the audience. This wastes time for all users and impedes the user from completing the task of communicating clearly through the video conference.

3.3.3. *Affordances*

While the affordances to alert the user of a muted microphone are not completely absent, there are not enough alerts to the user that the microphone is currently muted. This increases the cognitive load for the user and may even result in learned helplessness when executing the task. The user may rely on affordances from outside of the interface to alert them to a muted microphone such as participation from other members of the conference call.

3.3.4. *Discoverability*

When using text chat to communicate with other users, the interface is not discoverable. The interface does not teach users, especially novice users how to send private messages and public messages. Often leading to embarrassing moments where the user sends private messages to the public chat.

3.3.5. *Consistency*

3.4. Why doesn't it work well?

3.4.1. *Slip*

The reason for the common slip of the user accidentally turning on video is the placement of the audio and video buttons. The two buttons are placed next to

each other meaning that it is very easy for the user to unintentionally press the incorrect button.

3.4.2. Gulf of Evaluation

The gulf of evaluation is large because the user is unable to easily evaluate where the message is sent before sending messages. This is because all chats whether private or public occur on chat bubble with a small header text displaying the name of the recipient. Replying to private messages is difficult within this interface because of a lack of affordances alerting the user to where a private message is being sent.

3.4.3. *Affordances*

As stated previously, the text chat interface does not provide enough affordances to alert the user to the current chat mode. Because of the lack of affordances the rate of slips made by the user increases and eventually leads to an increase in cognitive load.

3.4.4. *Discoverability*

While the interface is discoverable overall, certain features such as the alerting of the user to a muted microphone are slightly hidden. This causes the interface to be slightly less teachable, especially for novice users.

3.4.5. *Consistency*

Users usually expect separate message bubbles for different chats, however, the interface often does not meet user expectations, causing an increase in cognitive load for the user. This part of the interface is actually inconsistent with the interfaces of messaging apps.

4. INTERFACE REDESIGN

Figure 1—Interface Redesign 1 separating the Microphone and Video Buttons.

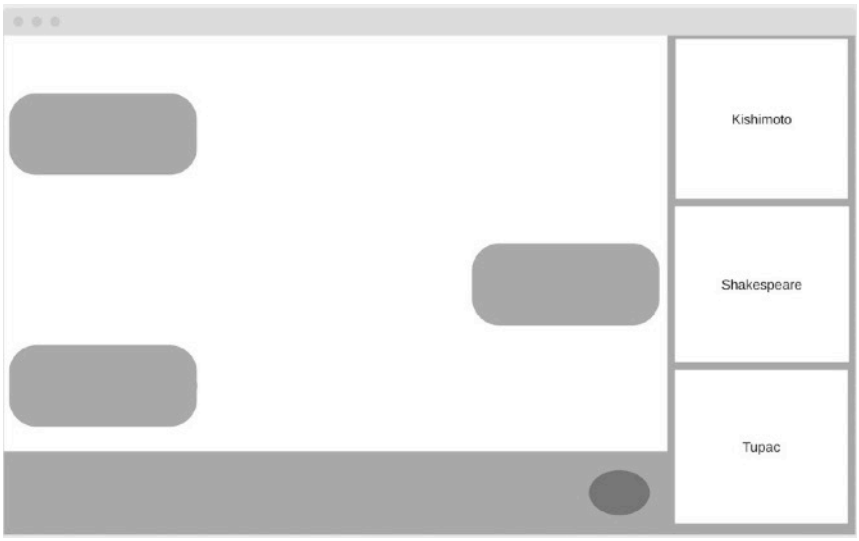

Figure 2—Interface Redesign 1 allowing the user to select chat groups more easily.

5. INTERFACE JUSTIFICATION

5.1.1. Gulf of Evaluation

In general the gulf of evaluation is narrowed for the user by allowing the user to clearly see if a message has been sent to the proper party. In addition, the separation of the information and text messages also helps to narrow the gulf of evaluation.

5.1.2. Cognitive Load

The interface reduces the cognitive load faced by the user by providing more affordances to alert the user to chat messages. This is especially the case in the redesigned interface where the chat messages have clear separation amongst different chat groups.

5.1.3. Simplicity

The interface is simplified by reducing the amount of information the user must process when sending chat messages. This occurs because different chat groups are separated into separate chat bubbles.

Simplicity is found in redesign of adding more spacing between the audio and video button. This reduces the chance that user will accidentally hit the wrong button.

5.1.4. Mapping

The interface allows for information to appear in a natural and logical order. Familiarity with previously existing chat interfaces is leveraged to allow the mapping to inform the user's execution of the task.

5.1.5. Flexibility

The principle of flexibility is found throughout the interface as a means to speed up the actions that the user is able execute. The redesigned interface provides this in the form of more intuitive chat bubbles as well as a separation of conversations.

In the improvement of spacing between the audio and video buttons, flexibility is leveraged to reduce the clutter of information for the user. This allows user actions to be made more efficiently.

6. EVALUATION PLAN

6.1. Evaluation Plan

An interview will be conducted to evaluate the wireframe prototype. There will also be a variation of the wireframe prototype representing the current interface.

Participants will include friends, family and classmates. Some participants will be selected based on the interviewer's prior knowledge of their level of expertise using the platform. Other participants will be selected on a volunteer basis. All interviews will take place in a one on one video call and will be recorded.

6.2. Evaluation Content

The interview will follow a rigidly structured format, with scripted questions. The interviewer will not ask unscripted questions and generally will not speak outside of the script unless the participant asks for clarification on a question or task.

The interviewer will first explain the task of using the microphone controls during a Zoom meeting as well as the task of sending text messages during the meeting. Next, the interviewer will then ask the user to execute the task with the wireframe prototype. The subject will then be given the wireframe prototype either representing the redesigned interface or the unchanged interface. Afterwards, the contrasting interface will be presented to the subject. Finally, the subject will be asked several questions evaluating satisfaction with both prototypes.

The following questions will be asked during the interview with impromptu follow up questions being asked:

- What is your primary objective when opening Zoom?
- Are there any other objectives, if any, you have when using Zoom?
- What device to you typically use to access Zoom?
- How difficult is it to control your microphone status with the Interface A?
- How difficult is it to control your microphone status with the Interface B?
- What type of information would like to see during a meeting?
- Is Interface A or Interface B is more convenient for sending private messages?

6.3. Data Inventory

The evaluation will address requirements in the data inventory by helping to more clearly define users. Most importantly it will help to identify the differences in items such as context, needs, and goals between different user profiles. The evaluation will allow users to self identify items such as tasks, needs, and goals. The evaluation will help to gauge whether requirements have been met because questions from *the data inventory will be directly mapped to questions* from the interview.

- Who are the users?
  - This will be self identified by the users possibly in follow up questions.
- Where are the users?
  - The question "What device to you typically use to access Zoom?" will directly satisfy this requirement.
- What is the context of the task?
  - This will be observed through implicit interpretation of user answers to the question "What device to you typically use to access Zoom?".
- What are their goals?
  - This will be directly self identified by the user's answer to "What is your primary objective when opening Zoom?".
- What do they need?
  - This will also be directly self identified by the user's answer to "What is your primary objective when opening Zoom?". This requirement will also be explored in the question "What type of information would like to see during a meeting?"
- What are their tasks?
  - This will be directly self identified by the user in the question "Are there any other objectives, if any, you have when using Zoom?"
- What are their subtasks?
  - This will be directly self identified by the user in the question "Are there any other objectives, if any, you have when using Zoom?" As well as in the questions "How difficult is it to control your microphone status with the Interface A?" and "How difficult is it to control your microphone status with the Interface B?"

6.4. Bias Control

In order to alleviate confirmation bias, the investigator will look for information that contradicts their viewpoint. To reduce social desirability bias the investigator will phrase questions with participants in a way that hides the desired response. Recall Bias will be minimized by not asking questions that rely on the participants memory.

7. EVALUATION EXECUTION

7.1. Raw Results

Below is a summary of the questions and answer discussion from two interviews conducted for the purpose of evaluating the redesigned interface.

Subject 1: (Female, 80, Occasional User)

- What is your primary objective when opening Zoom?
  - **Usually I just want to talk to my grandkids that live far away from me.**
- Are there any other objectives, if any, you have when using Zoom?
  - **No not really anything that I can think of.**
- What device to you use to access Zoom?
  - **I use my Tablet mostly.**
- How difficult is it to control your microphone status with the Interface A?
  - **It is not difficult at all, this is like the one I'm used to.**
- How difficult is it to control your microphone status with the Interface B?
  - **I'm not use to the new positioning of it but it doesn't seem too difficult.**
- What type of information would like to see during a meeting?
  - **Maybe alert me to when the .**
- Is Interface A or Interface B is more convenient for sending private messages?
  - **I liked the larger size of Interface B for the messages. So I think that one was more convenient.**

Subject 2 (Female, 50, Frequent User):

- What is your primary objective when opening Zoom?
  - **Usually to chat with friends, or attend a remote social gathering.**
- Are there any other objectives, if any, you have when using Zoom?
  - **I'm an extroverted person so I really like relaxing with Zoom. This pandemic has made me feel lonely so getting on Zoom gives me something to do to occupy my time.**
- What device to you use to access Zoom?
  - **It really depends on where I am or what I'm doing. If it's a more formal meeting, I'll usually use the computer. But if it's a quick chat with friends or I'm doing some cleaning or something around the house I'll use my phone or iPad.**
- How difficult is it to control your microphone status with the Interface A?
  - **I would say pretty easy I think it's pretty similar to the Zoom app.**
- How difficult is it to control your microphone status with the Interface B?
  - **This one was also pretty easy. But now that I think about it I like how the other one had the buttons spaced out a little bit. Sometimes I hit the wrong button when I'm in a rush.**
- What type of information would like to see during a meeting?
  - **I wish I could see the timezone everyone is in. I usually talk to friends from all over the world sometimes, at the same time. But I forget what time it is for them. So sometimes they want to go to bed ,but are too nice to say so.**
- Is Interface A or Interface B is more convenient for sending private messages?
  - **The first one looked like the Instagram chat so I think that one was easier. I will say that I don't really send text messages through Zoom though. I usually, just text people on my phone.**

7.2. Feedback Analysis

Some of the key takeaways from the interviews were that **depending on the user's level of expertise, the changes to the interface were more likely to be met with resistance**. This was especially the case for the redesigned microphone button. However, for more experienced subjects the change to the microphone button allowed them to use the interface more quickly and efficiently with less error.

A surprising discovery was **some subjects were more likely to leave the interface to complete the task of sending a text message.** While some of the feedback from the subjects also included the redesigned chat interface being more useful, it seems that because of the infrequent use of the interface, it may not be worth it to change the current chat interface. It is also of note that in general **the modified interface overall had more positive feedback from subjects**. The answer to the opened question, "What type of information would like to see during a meeting?", suggests interface improvements with respect to different timezones and how they are displayed within the interface.

7.3. Changes Based on Feedback

Some changes based on the feedback of the participant, might be to introduce a learning method to help novice users adjust to the new interface. However, due to the age of the participant it is uncertain if this is necessary. More needfinding would be necessary to assess the need for such changes.

Based on the evaluation, some changes that could be implemented include adding a world clock, that displays the different timezones of current meeting participants. Next steps for including this information might begin with a survey to see what percentage of users hold videoconferences with users in in differing timezones.

8. APPENDICES

8.1. Survey Results

response,Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8

1,5,4,Tencent Meeting,No,For learning,4,5,No.

2,5,5,DingTalk,.,For my online classes.,5,3,No

3,3,4,DingTalk;Tencent Meeting,no,Because I need to use it for taking classes.,2,3,"In many people's video conferences, there will be unsmooth phenomena."

4,4,3,DingTalk,No.,"Because of the pandemic, we need to use it for online classes.",4,5,No.

5,5,4,Tencent Meeting,nope,because my teachers use it :),3,5,nope :)

6,4,5,DingTalk,Nothing ,Study and save documents ,5,4,Can open more kinds documents.

7,5,4,Zoom;DingTalk;Tencent Meeting,no,no,4,4,no

8,5,3,Tencent Meeting,no,"Because of the simple page,facial features,replaceable background…",2,4,function of preventing mistakenly touching

9,3,3,Zoom,zoom,my school use it,4,4,add friends list

10,4,3,DingTalk,Nothing,Class needs,4,3,Nothing

11,5,4,DingTalk,listed above (ding talk),sound functions,4,4,not yet.

12,5,4,DingTalk,",,",because my teacher use this platform to teach,4,4,no

13,3,3,DingTalk,we chat,It's very convenient and popular during people,4,3,Nothing

14,5,2,DingTalk,Super star learning,attend class,4,4,no

15,4,2,DingTalk,ding talk,for attending class…,5,2,no~

16,4,4,Tencent Meeting,No,Easy to control,3,4,No

17,5,4,DingTalk;Tencent Meeting,no,easily and helpful,3,5,No

18,5,4,DingTalk,No,"convenient, support to watch video playback",3,5,No

19,4,4,Zoom,Google Meet,My company told me to use it,4,2,No

20,5,2,DingTalk;Tencent Meeting,no,to attend classes,4,5,no

21,5,5,Tencent Meeting,.,Have classes,4,5,Nothing

22,4,4,Zoom;Skype;Tencent Meeting,No ,it is stable and powerful ,5,2,Improve the stability

23,4,4,DingTalk,????,efficient,4,3,?

24,4,4,DingTalk,xue xi tong,It makes my online teaching convenient,4,4,no

25,5,4,DingTalk;Tencent Meeting,As above. ,Have lessons or meetings. ,4,5,No ideas.

26,3,2,DingTalk,No,Be asked,3,4,Yes

27,4,4,Zoom;Skype,Teams,work mandate,4,4,na

28,5,5,Zoom,n/a,work,4,3,always display names in frames. some apps hid the name and i dont know the name of the person speaking.

29,5,4,Zoom;Skype,None,Required for work,4,5,None

30,4,4,Zoom,I also use Microsoft Teams a lot,"Mainly because these platforms are popular, so I kind of had to learn how to use them",4,4,"I don't like that some platforms have the ""turn on/off camera"" button next to the ""mute/unmute button"". Sometimes I accidentally turn my camera on during meetings because I was trying to unmute my microphone"

31,3,4,Zoom,NA,Work,4,4,NA

32,5,5,Zoom,Microsoft Teams,Only platform used at work,5,5,Make it more obvious to a user when they're on mute

33,4,4,Zoom;Skype,n/a,it's what the host was using,4,4,unsure

34,4,4,Zoom,Microsoft Teams,For work.,5,4,N/A